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Reformation in Patent Procedure

Reference has already been made in our columns to the Kahn act, passed for the protection of foreign exhibitors at the Panama-Pacific International Exposition, notably on page 825, Oct. 25, and page 1131, Nov. 29. The subject is discussed in a characteristically convincing manner by Dr. L. H. Baekeland on page 1146 of this issue. The Kahn act referred to, which represents the result, on the part of persons unqualified for the formulation of such an act, of an honest attempt to protect exhibitors for a limited period, has produced much confusion and dissatisfaction by its interference with our existing patent laws, unsatisfactory as they are admitted to be. Dr. Baekeland urges the formation of a non-political commission of men familiar with the practical working and shortcomings of our patent system to investigate the patent situation and make recommendations for a proper revision of our patent laws and Patent Office procedure. Such a commission, which has already been proposed by the Inventors' Guild, as noted in our issue dated Aug. 9, 1913, would go far toward preventing the formulation of legislation of the Kahn act type.

The Problem of the Small Plant

The somewhat detailed account of a small central station in Windsor, Vt., to be found elsewhere in our columns is particularly instructive as representing conditions totally different from those existing in ordinary central-station practice and yet typical of many electrical developments which are of large service to the community. A little town with a few small industries and a population of a progressive turn of mind is by no means to be despised as a market for electricity. A plant in such a place cannot be "floated" with any advantage to the promoters, but it neverthless may be made a paying investment, as this one seems to have been, through persistent effort and economical administration. The main energy-supply equipment comprises a pair of hydroelectric stations, both small, yet for most of the year quite adequate for the work of the system. One of them has only a single 75-kw generator on a single wheel, the other operates a 150-kw and a 40-kw generator. There is little water storage, yet from October to May the larger of the two plants does most of the work of distribution while the smaller is devoted to furnishing energy for running a sawmill. When the low-water season begins in May the two plants are operated in multiple through the evening and the late night load is then taken by the larger. Finally, when water grows scarce at midsummer there is not enough for a considerable period to justify running the wheels, and energy for daytime load is then purchased from a manufacturing plant to which secondary service is furnished for its advantage through the winter months when water is abundant. The night load is then carried by the steam auxiliary. Nearly all the water available in the stream is thus utilized and the period of running by steam is brief. The plants being near together and operated in a systematic manner, the force is small, consisting of only six men, including the superintendent, and at least one of these is only a temporary employee. The nature of the load is somewhat interesting. Besides the town lighting and pumping for the water-works, there is a considerable amount of miscellaneous motor service and plenty of lighting to be done. The gross receipts from this little community of 2500 inhabitants rise to $5.60 per capita, although the total number of consumers is only about 300. And withal the rates are not high, the base price for lighting being 15 cents per kw-hr. and for motor service just half that amount, with liberal discounts. The whole plant is an example of intelligent development of a small field to the great advantage of the community and on a basis that has now become a paying one. A plant under similar conditions, but with the advantage of being erected as a whole simultaneously, instead of being developed from one which had eked out a precarious existence for a number of years previously, could probably turn out energy more economically, but it could scarcely be able in so small a place to secure a materially larger volume of business. There are scores, or even hundreds, of little places with available small water-powers which might well profit by the example of Windsor. Such enterprises intelligently administered can be made good investments on a small scale and deserve far more attention than they have yet received.

Central-Station Rate-Making

In his letter on page 1167 Mr. L. H. Conklin says that it is surprising to find how frequently the different rate schemes of the principal companies, though they are wide apart in detail, result in approximately the same net rate. This, of course, is a very general statement and should not be taken as an indication of a belief that the average rate of central stations in different communities is the same. It is to be taken, rather, as a support of the equity and reasonableness of the theory of the variable-rate system used by central stations and a plea for the uniform expression of such rates. If electrical supply undertakings are to be successful, there must be a certain rough approximation in their average rates for energy as well as in their average cost, and the proportion of one to the other must be such as to leave a fair profit. The cost of furnishing service to a class of consumers in one community is not and cannot be the same as the cost in another com-

munity where conditions differ. The rate enjoyed by a large number of large consumers in a community which they dominate industrially is not necessarily the fair rate for a similar consumer in another district in which he is the sole representative of his class. In each community some one class of users may be sufficiently strong numerically and may require sufficient energy for their combined needs at certain periods of the day to be entitled to the rate that would be given in another community to another class of users. In neither case do the results of these particular rates determine the profit or loss of the companies. They are merged and diluted or strengthened by the income accruing from the rates covering other sources of business. If this were not so, variable rates would fail to solve the revenue-producing problem of the companies.

Westinghouse—the Man and the Engineer

The achievements of Mr. George Westinghouse, to whom was presented the Grashof Medal during the present week, are well known and need not be dwelt upon now. What may appropriately be discussed at this time is the personality which made possible the results obtained by Mr. Westinghouse. Any man who has known him long and well appreciates that the dominant fact of his powerful individuality is the mysterious quality which may be called personal force. Where he sat was indeed the head of the table, whether among friends or foes. Men might not wish to do what he wanted, but they did it. Imagination, tradition, usage attach power of this kind to certain positions in the world, but with Mr. Westinghouse the power is an attribute of his personality. Moreover, he is indomitable. Fate cannot subdue him. The events of the last six strenuous, trying years have brought revelations of this quality astonishing even to those who had known him longest and best. Given such moral attributes in addition to a powerful mentality and a rare insight into the practical application of the laws of nature, and all the rest has followed without any mystery. It is a more or less conscious knowledge and appreciation of these facts that makes us all join with such pleasure in congratulating Mr. Westinghouse on the honor recently bestowed upon him and in wishing him many happy and prosperous years, which perhaps have in them less of endeavor than heretofore but more of leisurely dignity and public recognition.

It is not necessary for us to discuss here the relations of Mr. Westinghouse with other branches of the modern industrial field, but we may appropriately devote a few remarks to what is owed him by the various branches of electrical development. Undoubtedly his first and permanent claim to consideration is his early and swift intuitive recognition of the advantages of the alternating current. He, if anyone, was its protagonist in this country and his adoption of the Gaulard and Gibbs system, and the modification of it to American conditions and necessities, was one of the great landmarks in electrical advance and history. At an early stage, when only a very few had become awake to the opportunities presented by this addition to the resources of electricity, Mr. Westinghouse was devoting his tremendous energies and driving power to the practical utilization of the alternating current. He gathered around him talent of the first order, represented by men whose names are as familiar in our mouths as household words, and for the last twenty-five years the whole development of the central-station art and of energy transmission has very largely been influenced and determined by the impress which he thus placed upon it. No matter who became associated with him, the leadership and impetus and success rested largely, if not wholly, with him.

Brilliancy an Aid in Good Lighting

Possibly the excessive brilliancy of the new high-efficiency, nitrogen-filled tungsten-filament lamp is a blessing in disguise because it renders imperative methods of shading the lamps and diffusing the light from such a source. There is little temptation to hang the bare lamp within range of vision, as has been so commonly done with incandescent lamps of various kinds in the past. With a lamp of such high efficiency the losses inseparable from various methods of diffusion become less important in dollars and cents. For this reason, and because of the unbearable brilliancy of the unshaded lamp, the new nitrogen-filled tungsten lamp is likely to help rather than hinder the practice of illuminating interiors in a manner safe and comfortable for the eyes of the occupants.

The Study of Visual Acuity

Within the past two or three years it has been made very clear that the chromatic aberration of the eye, which is generally unnoticed, is sufficient to interfere with visual acuity, so that a substantially monochromatic light affords considerably better seeing at equal luminosity than does ordinary light which includes a considerable range of spectral colors. The reason for the difference is plain enough from the characteristics of the eye as an optical instrument, but so little does the ordinary man appreciate the existence of chromatic aberration in his eye that he is loath to believe that it constitutes a considerable defect which, in fact, would be very serious were it not that the extreme colors of the spectrum are of very low luminosity.

In a brief paper in the current issue Mr. M. Luckiesh drives home a lesson in applied optics very effectively by making a direct comparison between acuity with monochromatic light and that obtained either from the light of a tungsten lamp or from daylight. He finds, as was to be anticipated, the latter decidedly inferior to the former in giving sharp vision of details. There proved to be very little difference between the light of the tungsten lamp and natural or artificial daylight in the matter of acuity. It was also noted that the difference between these and monochromatic light with respect to acuity decreases as the illumination on the test object increases. The cause of this variation is not apparent, although it is not unlikely that part or the whole of it may be due to the contraction of the pupil in strong light so that all aberrations are diminished in apparent value. In any event, this work of Mr. Luckiesh should leave no doubt in the mind of anyone that so far as seeing detail is concerned monochromatic light from

the middle of the spectrum gives sharper vision of black and white details than does any light having a considerable range of spectral colors, whatever its source.

An interesting side investigation added by Mr. Luckiesh is the comparison between acuity in ordinary light and that obtainable by the use of protective spectacles which cut down the spectral range to within moderate limits. He found that yellow-green glasses used in bright daylight have a very marked effect in improving acuity. Part of the difference perhaps may be attributable to the general reduction of glaring light entering the eye from the open sky, but doubtless narrowing the spectral range of the effective light was an important factor in the result. Could one obtain conveniently glasses transmitting only a nearly monochromatic strip in the yellow green the effects noted by Mr. Luckiesh would be considerably enhanced. For the general purposes of illumination monochromatic light looks queer, but it is not without its virtues and may be at times exceedingly useful.

The President's Message

President Wilson's references to matters concerning the electrical industry promise an effort toward needed legislation. Neither in word nor in spirit does the Executive inveigh against business or business methods, but he candidly and earnestly presents the need of action in regard to conservation of resources and of supplemental legislation to clarify the "area of debatable ground" unfortunately left open by the Sherman law for the confusion of trade and industry. The proper settlement of both of these large questions will promote beneficial commerce, and in view of the public and commercial interest in the matters and the tendency of discussion to crystallize upon reasonable, acceptable policies it cannot be doubted that there is more hope for the passage of definite interpretative legislation than at any time in the past.

Some comment was heard concerning the failure of the President to appear at the recent National Conservation Congress in Washington. Whether or not he stayed away because he was not in sympathy with the strong political complexion of the Conservation Congress it is unnecessary to guess, but in the message which he delivered to the real Congress this week he showed unhesitatingly that he is in favor of conservation with use. We share his belief "that a policy can be worked out by conference and concession which will release these resources and yet not jeopard or dissipate them." Such an expression of policy, recognizing a common interest in the matter of development, is more likely to accelerate the fixing of a sane middle ground for negotiation and progress than the clamorous antagonistic cry of monopoly with which so many of the governmental utterances on this topic have been mixed. The President did not say, as he did with reference to the Sherman law, that he would make conservation a subject of a special message later. If he does not do so, he has at least given expression to his idea that use with proper regulation is the policy that should prevail and that the rights of the states and the nation should be merged satisfactorily in the common purpose of utilization. If Congress takes to itself the spirit of these utterances, which do not assume at the outset that utilization is monopoly and non-utilization is beneficent, it will help to solve the problems that ought to be settled, fairly and with full recognition of the public interest, but on a business, not a political basis.

No doubt President Wilson's program, so far as the Sherman anti-trust law is concerned, is still the subject of his deep study, but there is no reason to think that he has withheld from public knowledge the lines of recommendation or action on which he has thus far resolved. His position is one of opposition to private monopoly but of outspoken desire to relieve business men of all uncertainties of law. Just how "private monopoly" is to be defined, so far as it can be defined by a statement of the Executive's opinion without legislation or judicial interpretation, the President does not now state. If he refers to the abhorrent trade practices which the Sherman law was intended by its far-reaching language to prevent, he clears the way for legislation without undue disturbance. The presidential view that the Sherman law should remain unaltered represents the sentiment generally prevailing at this time. We have then his opinion that the area of debatable ground should be reduced as much as possible. Manifestly, this is a step that cannot be taken without as clear an understanding as can be had to show what ground is debatable and what is non-debatable. Practices of business men now surrounded by a doubt that no governmental administrative body is properly authorized to settle will be definitely allocated as either infractions of the law or in conformity with it. Next to wise currency legislation, this is the most needed legislation of the times. The law and the policy of the government with respect to its interpretation should be so plain "that he who runs may read."

With an understanding of acts which are infractions of the law and of the acts which do not contravene the law there will remain that area of uncertainty which causes hesitation and paralysis of business. The government ought to rid business of this handicap. This is not a proper function for the Attorney-General, upon whom, nevertheless in the absence of a duly constituted body it has devolved so far as it has been done. It could be the function of a new Interstate Trade Commission, if such a body were created with power to act and wisdom to protect and upbuild. Such a commission could not be expected to be the final judge, but it could express its best judgment, subject of course to reversal by the courts on appeal either by the government or by the company affected. The advantage of such a commission is that it would operate to effect publicity in all matters concerning competitive relations. The disadvantage would be that the commission, unless endowed with wisdom, would fail to be that protecting, upbuilding force which all industries seeking lawful methods of management have a right to expect from the government. Certainly the time has come, if, indeed, it was not here long ago, when, if prices on competitive goods made by different manufacturers are the same, the fact ought to be recognized openly and not regarded as a secret. The President's special message on the Sherman law will be awaited both with hope and with intense interest.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

A. I. E. E. December Meeting

The general subject of a meeting of the American Institute of Electrical Engineers to be held in New York on Dec. 12 will be "Insulating Materials." Mr. F. M. Farmer, of the Electrical Testing Laboratories, New York, will present a paper entitled "The Dielectric Strength of Thin Insulating Materials." Further communications on this subject will be presented by Messrs. E. E. F. Creighton and F. W. Peek, Jr., of the General Electric Company, and by Messrs. C. E. Skinner, R. P. Jackson and Phillips Thomas, of the Westinghouse Electric & Manufacturing Company. At the close of the technical session a smoker will be held in the Institute offices.

Chicago City Council Passes Rate-Regulation Ordinance

At a special meeting of the Chicago City Council held on Nov. 26 the ordinance reported by the committee on gas, oil and electric light, fixing a schedule of rates to be charged by the Commonwealth Edison Company for supplying electricity in the city of Chicago for a five-year period beginning Dec. 1, 1913, was passed by a large majority. The rates as fixed are 10 cents per kw-hr. for the first thirty hours' use per month of the maximum, 5 cents per kw-hr. for the next thirty hours' use, and 4 cents per kw-hr. for all excess. The tertiary rate of 4 cents is to be reduced to 3 cents on March 1, 1914. It is believed that Mayor Harrison will not veto the ordinance and that it will become effective. The rates are based substantially on the recommendations of Mr. Ray Palmer, the city electrician, who, assisted by Mr. A. C. King, assistant city electrician, and Mr. C. B. Willard, expert accountant for the city comptroller, made an exhaustive report on the subject. The rates in the new schedule are founded on a reduction of $654,000 a year on the basis of the 1912 business of the company.

Laws of Wireless to Be Codified

Two commissions, one international and the other British in organization, soon will begin a series of investigations in the hope of being able to codify the various natural laws which are believed to govern wireless telegraphy. The English commission, which is known as the committee of the British Association, will devote its investigations to the qualitative phases of the problem, while the other organization, called the International Radio-Telegraphy Commission, will study the quantitative aspects of the question.

The British committee will endeavor to discover by extensive simultaneous observations at various points on the earth those regularities of phenomena commonly described as "natural laws." It is hoped that if these laws are once codified it will be possible to extend greatly the commercial possibilities of wireless by obtaining valuable information concerning the electrical conditions of the atmosphere, these having a powerful effect on the working of wireless systems.

The international commission will begin its work from a station near Brussels, and from this station on a specified date certain signals will be sent out for the reception of investigators and national committees, which are being organized in every participating country. Measurements will be made by the transmitting experts at Brussels and by the receivers in various countries. The international commission will compare the results of these observations, especially with regard to the effects of time, direction and distance on the strength and regularity of the received signals.

The objective of the work of both bodies is the elimination of the difficulties of communication encountered near the periods of sunrise and sunset and from atmospheric conditions generally.

Extracts from the President's Message

President Wilson, following his custom, read in person on Dec. 2 his message to Congress. It contains references to conservation and the Sherman anti-trust law.

In leading up to his remarks on the subject of conservation the President advocated government construction and operation of railways in Alaska. How the tempting resources of Alaska are to be exploited is another matter to which the President will call the attention of Congress from time to time. This, the President said, "is a part of our general problem of conservation. We have a freer hand in working out the problem in Alaska than in the states of the Union, and yet the principle and object are the same wherever we touch it. We must use the resources of the country, not lock them up.

"There need be no conflict or jealousy as between state and federal authorities, for there can be no essential difference of purpose between them. The resources in question must be used, but not destroyed or wasted; used, but not monopolized upon any narrow idea of individual rights as against the abiding interests of communities. That a policy can be worked out by conference and concession which will release these resources and yet not jeopard or dissipate them, I for one have no doubt; and it can be done on lines of regulation which need be no less acceptable to the people and governments of the states concerned than to the people and government of the nation at large, whose heritage these resources are. We must bend our counsels to this end. A common purpose ought to make agreement easy."

Concerning the Sherman law and questions arising therefrom President Wilson said:

"I think that all thoughtful observers will agree that the immediate service we owe the business communities of the country is to prevent private monopoly more effectually than it has yet been prevented. I think it will be easily agreed that we should let the Sherman anti-trust law stand, unaltered, as it is, with its debatable ground about it, but that we should as much as possible reduce the area of that debatable ground by further and more explicit legislation, and should also supplement that great act by legislation which will not only clarify it but also facilitate its administration and make it fairer to all concerned.

"No doubt we shall all wish, and the country will expect, this to be the central subject of our deliberations during the present session; but it is a subject so many-sided and so deserving of careful and discriminating discussion that I shall take the liberty of addressing you upon it in a special message at a later date than this.

"It is of capital importance that the business men of this country should be relieved of all uncertainties of law with regard to their enterprises and investments and a clear path indicated which they can travel without anxiety. It is as important that they should be relieved of embarrassment and set free to prosper as that private monopoly should be destroyed. The ways of action should be thrown wide open."

Westinghouse Receives Grashof Medal

On behalf of the engineering profession of Germany, the American Society of Mechanical Engineers presented to Mr. George Westinghouse, the well-known engineer and inventor, the Grashof medal. The presentation took place in the auditorium of the Engineering Societies Building in New York last Wednesday night during the annual meeting of the society.

The Grashof Medal

The Grashof Medal was founded by the Verein Deutscher Ingenieure of Germany in memory of Franz Grashof, famous engineer and professor and author of many important works on the theory of elasticity, general mechanics and machine design. It is given by the Verein only on recommendation of the council, and by unanimous vote in open general meeting of the Verein, to men who have rendered pre-eminent service in the field of engineering either in research or in practical activity. It is the highest honor in the gift of the engineering profession of Germany.

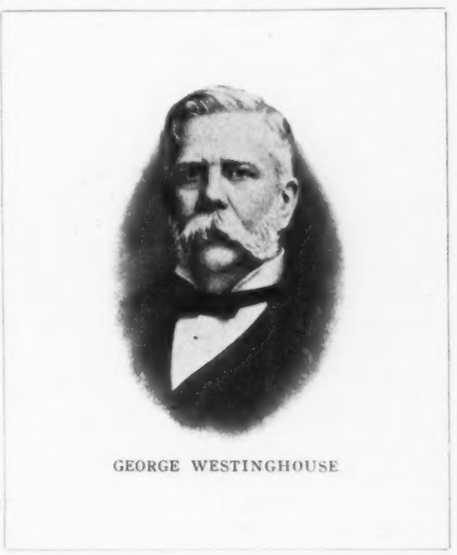
The medal was conferred on Mr. Westinghouse at the fifty-fourth annual meeting of the Verein Deutscher Ingenieure in Leipzig, Germany, on June 23, the officers and members of the American Society of Mechanical Engineers being present. In presenting the medal at that time Dr. Oskar von Miller, the president of the Verein, said:

"The distinction conferred by the largest scientific and technical society in the world is not a thing that is given away on a festive occasion, nor one to serve as a mark of attention and courtesy; it can be won only by actual services for the good of humanity. Engineers will have no doubt that George Westinghouse, whose name is so well known throughout the world, does deserve this distinction."

Career of George Westinghouse

Mr. George Westinghouse was born at Central Bridge, N. Y., Oct. 6, 1846; his parents were George and Emeline Vedder Westinghouse. His father's ancestors came from Germany and settled in Massachusetts and Vermont before the Revolution and his mother was of Dutch-English extraction. Mr. Westinghouse's father was also an inventor and in 1856 removed with his family to Schenectady, N. Y., where he established the Schenectady Agricultural Works. Curiously enough the building in which young Westinghouse received his first mechanical training is still standing, directly opposite the great works of the General Electric Company at Schenectady. George Westinghouse was one of five sons, three of whom are now dead and the other, Herman H. Westinghouse, is associated with his brother in his numerous enterprises. The boy attended the public schools of the town and spent his leisure moments in his father's machine shop. Before he was fifteen years old he invented and built a rotary engine. In June, 1863, although not seventeen, young Westinghouse enlisted in the Twelfth New York National Guard and shortly after joined the Sixteenth New York Cavalry. He was honorably discharged in November of the following year and a month later accepted an appointment as third assistant engineer in the United States Navy, reporting for duty on the *Muscota*, from which he was transferred to the *Stars and Stripes* and detached and ordered to the Potomac flotilla on June 28, 1865.

At the close of the Civil War Mr. Westinghouse entered Union College, where he remained until the end of his sophomore year, leaving to enter upon active life and to find a wider scope for his inventive genius. In 1865 he invented a device for replacing railroad cars on the track, which was manufactured by the Bessemer Steel Works at Troy, N. Y. Going to Troy one day, a delay caused by a collision between two freight trains suggested to Mr. Westinghouse the idea that a brake under the control of the engineer might have prevented the accident. His first patent for an air brake was awarded a few years after, on April 13, 1869, and the Westinghouse Air Brake Company was formed on July 20 of that year. In 1871 Mr. Westinghouse went abroad to introduce the air brake in England and between 1871 and 1882 he taxed his inventive ability to meet new conditions of railroad practice. Meanwhile he invented the automatic feature of the brake and in 1886 was awarded a patent for a quick-action brake. In 1863 Mr. Westinghouse became interested in the operation of railway signals and switches by compressed air and developed and patented the system now manufactured by the Union Switch & Signal Company.



GEORGE WESTINGHOUSE

Formation of the Electric Company

In 1886 the Westinghouse Electric Company was formed for the manufacture of lamps and electric lighting apparatus, Mr. Westinghouse having become interested in the subject. The business rapidly developed and in 1889 and 1890 the company absorbed the United States Electric Lighting Company and the Consolidated Electric Light Company. In 1891 all these properties were reorganized into the Westinghouse Electric & Manufacturing Company, which owns extensive works at East Pittsburgh, Pa. While the company was still growing Mr. Westinghouse had the foresight to gather about him such able and talented engineers as William Stanley, Nikola Tesla, O. B. Shallenberger and others who contributed not a little to the great development his practical imagination foresaw. Mr. Westinghouse rendered an invaluable service to the industry when in spite of strong opposition he succeeded in introducing the alternating-current system of distribution. The direct-current system was then used exclusively in this country. In 1885 Mr. Westinghouse sent the late Franklin Pope, then on the consulting staff of the Westinghouse company, to England to purchase the American rights to the invention of Messrs. Goulard and Gibbs, two British electricians who experimented with what they called alternating currents. Within a month after Mr. Pope's return Mr. Westinghouse had set up a laboratory to develop the Goulard-Gibbs invention commercially. From that moment the real growth and application of elec-

tricity to lighting, manufacturing and transportation may be said to date. He backed Tesla financially and with shop facilities in developing the induction motor, and built the first ten great dynamos for Niagara Falls. The alternating current which Mr. Westinghouse fought into universal recognition has alone made possible long-distance transmission of energy and the development of hydro-electric power far remote from the point of its utilization.

Almost akin to his work for electric transmission of energy was his system for controlling natural gas and conveying it through pipe lines for long distances, thereby establishing the practicability of utilizing natural gas as fuel in homes, mills and factories. Mr. Westinghouse has also taken a foremost part in the development of gas engines and in adapting steam turbines to electric driving. Besides his genius as an inventor, Mr. Westinghouse is well known as an organizer and financier. The Sawyer-Man incandescent lamp, the Nernst lamp and the Cooper Hewitt mercury vapor lamp were all put on a commercial basis by Mr. Westinghouse.

To Mr. Westinghouse was given the honorary degree of Doctor of Philosophy by Union College in 1890, and in 1906 the Königliche Technische Hochschule of Berlin bestowed upon him the degree of Doctor of Engineering. His decorations comprise the Legion of Honor of France, Royal Crown of Italy, and Leopold of Belgium. He was the second recipient of the John Fritz medal, and is an honorary member of the American Society of Mechanical Engineers, of which he is also a past-president, the National Electric Light Association and the American Association for the Advancement of Science. He is president of a large number of corporations having an aggregate capital of over $100,000,000, the largest of which are the Westinghouse Air Brake Company, the Westinghouse Machine Company and the Union Switch & Signal Company. He is also the head of about a dozen companies abroad, the largest of which are in London, Manchester and Havre. Mr. Westinghouse was married Aug. 8, 1867, at Brooklyn, N. Y., to Marguerite Erskine Walker. They have one son, George Westinghouse, Jr., who is a graduate of Yale.

Supreme Court Decision on Copyright-Book Prices

The United States Supreme Court rendered a decision on Dec. 1 in a suit brought by R. H. Macy & Company, of New York, to enjoin the American Publishers' Association and the American Booksellers' Association from enforcing an agreement with agents not to sell books to the Macy firm, which had been offering them to the public at prices below the retail price fixed by the publishers.

The action was begun in the Supreme Court of New York and carried to the Court of Appeals. That court held that in so far as the agreement related to books not copyrighted it was in contravention of the anti-trust laws of the State of New York, but that as to books protected by federal copyright the publishers enjoyed a monopoly by virtue of their copyright and that the injunction would not lie.

Justice Day reversed the decision in an opinion which was concurred in unanimously by the other justices and held that the agreements between the publishers and booksellers contravened the Sherman anti-trust law and that this applied to the copyrighted as well as uncopyrighted books. Justice Day said:

"No more than the patent statute was the copyright act intended to authorize agreements in unlawful restraint of trade and extending to monopoly in violation of the specific terms of the Sherman law, which is broadly designed to reach all combinations in unlawful restraint of trade and tending, because of agreements or combinations entered into, to build up and perpetuate monopolies."

Justice Day declared that the associations formed a conspiracy in restraint of trade, had practically destroyed competition, and that in some cases booksellers had been driven out of business and ruined because they sold to the Macy firm.

Legalized Blackmail—A Sample of Ignorant Patent Legislation

By Dr. L. H. Baekeland

Do you happen to know of any old process, product, machine, composition, trade-mark or design for which it is impossible to obtain patent protection in the United States either because it is not an invention or because it is not new?

Do you wish to obtain four years of absolute monopoly for this old thing under protection of the United States government which will promptly help you in fining, confiscating, collecting damages, imprisoning and enjoining others from using the old thing? Well, nothing is easier, since the Kahn bill has become a law. All that you have to do is to file a patent in one of the many foreign countries where patents are obtainable without examination—by simple registration.

Select, for instance, France or, better, Belgium, where a title to your patent is delivered to you for the sum of about $4. Then afterward exhibit the patented article, trade-mark or design at the Panama-Pacific Exposition, register it there, and the trick is done.

From now on you have four years of absolute monopoly. You can exclude anybody in the United States from manufacturing or using your registered article, never mind whether or not it was in public use before. You can blackmail right and left, and the courts of Uncle Sam will help you in enforcing your easily acquired privileges, by injunction, confiscation, fine and imprisonment! This sounds rather strange, doesn't it, in a country like ours where legitimate patentees are so badly protected?

If you think all this is a joke, read the Kahn bill (H. R. 7595) and more particularly the following provisions:

"Sec. 3. That it shall be unlawful for any person without authority of the proprietor thereof to copy, imitate, reproduce or republish any pattern, model, design, trademark, copyright or manufactured article protected by the laws of any foreign country by registration, copyright, patent or otherwise, which shall be imported for exhibition at the Panama-Pacific International Exposition and there exhibited; and any person who shall infringe the rights protected under this act shall be liable—

"(a) To an injunction restraining such infringement;

"(b) To pay to the proprietor such damages as the proprietor may have suffered due to the infringement, as well as all the profits which the infringer may have made from such infringement, and in proving profits the plaintiff shall be required to prove sales only and the defendant shall be required to prove every element of cost which he claims, or in lieu of actual damages and profits such damages as to the court shall appear to be just;

"(c) To deliver up on oath, to be impounded during the pendency of the action, upon such terms and conditions as the court may prescribe, all articles alleged to infringe the rights herein protected;

"(d) To deliver up on oath for destruction all the infringing articles, as well as all means and devices for making such infringing articles.

"Sec. 4. That any person who wilfully and for profit shall infringe any right protected under this act, or who shall knowingly and wilfully aid or abet such infringement, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by imprisonment for not exceeding one year or by a fine of not less than $100 nor more than $1,000, or both, in the discretion of the court.

"Sec. 5. That Sections 25, 26, 27, 34, 35, 36, 37, 38, 39

and 40 of the copyright act approved March 4, 1909, are hereby made applicable to civil actions authorized to be brought under the provisions of this act.

"Sec. 6. That the rights protected under the provisions of this act shall begin on the date of the arrival of the pattern, model, design, copyrighted article, trade-mark or manufactured article so imported for exhibition within the grounds of the Panama-Pacific International Exposition at San Francisco, and shall continue for a period of three years from the date of the closing of said exposition."

This bill was hastily conceived to protect foreign exhibitors at the Panama-Pacific exposition.

Evidently neither the California framer of the bill nor President Wilson, when he signed this bill, was aware of its far-reaching provisions.

Yet the legislation just passed is not much worse than some of the provisions of the pending Oldfield bill and similar patent bills which have been proposed of late.

It shows how dangerous it is for congressmen or senators who have neither experience nor proper knowledge of our patent laws to tinker with patent legislation.

Just at this time Germany has also found it necessary to remodel her patent laws so as to bring them up to the requirements of modern times. This is the second time since 1877, when the first patent law was enacted in the German Empire. However, the methods of the Germans in changing their patent laws are strikingly different from ours. We let some congressmen or senators from States where a patent is scarcely known, except by name, draw up hit-or-miss-it bills, never minding whether they may strangle the very soul of invention, which insures the most desirable kind of competition, namely, competition by improvement.

In Germany the new patent bill was painstakingly prepared by a competent commission far removed from any political influence. This commission, in studying the subject, has taken advice and information from men who by experience and training could furnish the necessary help. Then this carefully worded bill was presented for discussion. In order to make discussion easy, the bill is accompanied by necessary explanations and data outlining the reasons for the proposed reforms.

When shall we have a competent patent commission to take up the revision of our patent system—a commission not made up of politicians, but of men who know something about our patent system, its practical working and its far-reaching influence on the healthy development of our country? Or shall we go on "monkeying with a buzz-saw"?

Settlement of General Electric Strike

A settlement between the General Electric Company and the striking employees at the Schenectady works was reached on Nov. 29. As a result the employees returned to work on Dec. 1. There was no disorder at any time and, so far as the demeanor of the men went, it remained to the last more of a "demonstration," as the men called it, than a strike. On the afternoon of Nov. 28 the employees marched peaceably to the works to get their wages in accordance with the published announcement of the company that the usual methods of pay would be followed. The announcement of the company, signed by Mr. G. E. Emmons, manager of the Schenectady works, asked the employees, "in order to avoid confusion, to be as quiet and orderly as possible." Mr. Emmons afterward expressed his gratification at the splendid showing made by the employees on this occasion.

The announcement of the committee of employees in regard to the settlement was as follows:

"As a result of the conference with officials of the General Electric Company Friday afternoon, your committee is satisfied that there was no intentional discrimination in laying off Mr. Dujay and Miss Leslie, and further that the company is not antagonistic to organized labor. We do not question the right of the company to reduce force when necessary in such manner as may be deemed best by the management. After careful consideration we believe that the action in calling a strike was largely due to a misunderstanding.

"While it is not possible to continue to employ the two individuals mentioned in their former places, the company, in its desire to continue the harmonious relations heretofore existing with its employees and to avert the distress and suffering which must necessarily follow as a result of a prolonged struggle, and as evidence of its good faith, agrees to place them within a week in other places to do work for which their experience fits them.

"We have given a pledge that such employees as remained at work shall be subjected to no annoyance of any sort, and that every effort shall be made to maintain cordial and loyal relations with the company. In return the company agrees that there shall be no discrimination against any of its employees on account of their participation in the strike.

"We recommend that all employees report for work in their usual places Monday morning. While it may not be possible to provide the entire force with work at that time, the company will make an effort to place as large a number as conditions permit."

Mayor George R. Lunn of Schenectady made a statement in which he said that he did not believe the settlement would have been possible if the bitter antagonism that generally operates in labor disputes had obtained. He complimented the strikers on the splendid order preserved during the strike.

Electrical Service at Harvard-Yale Football Game

Although electricity played a more prominent part in the reporting of the recent world's series of baseball games than in the football season just closed, it was an important factor in the transmission of scores all over the country from the Harvard-Yale game in Cambridge on Nov. 22. About fifty telegraph operators with an expert knowledge of the game were stationed on top of the Harvard Stadium and connected by Western Union, Postal and American Telephone & Telegraph circuits with many of the principal

TELEGRAPH OPERATORS AT YALE-HARVARD GAME

cities of the East. Newspaper service hot from the gridiron was given by direct wires running as far west as Chicago, and New York, Philadelphia, Washington and other places prominent in sporting circles kept close "tabs" on the pigskin during the historic struggle for its possession. Nearly 50,000 persons attended the game, about half of whom were transported to and from the grounds by

the Boston Elevated Railway, which, in addition to a large extra surface car service, ran four-car trains on a two-minute headway in the Cambridge subway for two hours before and two hours after the game. The largest number of telegraph circuits from the field were operated by the Western Union company, which had thirty wires in commission. Two operators placed in the players' dugouts on each side of the field kept the press operators in touch with all changes in line-up. The New England Telephone & Telegraph Company operated a special talking circuit from the side lines to the Cambridge exchange, whence the scores were relayed to all offices in the Boston metropolitan district.

Meeting of Electric-Sign Manufacturers

On Dec. 1, in the Hotel Sherman, Chicago, representatives of electric-sign manufacturers held a get-together meeting for the purpose of organizing a co-operative electric-sign manufacturers' society. The purposes of the organization, as stated by Mr. James H. Betts, New York, in his opening speech, are: the betterment of competitive conditions, stimulation of co-operation with the central-station men, endeavoring to bring about universal adoption of the rules of the Underwriters' Laboratories, urging local underwriters' boards to conform to rulings of the National Board of Underwriters in regard to electric signs, standardization of local city requirements for illuminated advertising, and the elimination of the prevailing evil of the electric-sign industry, namely, the use of competitors' designs submitted by a prospective patron. Many speakers broached the subject of co-operation with the National Electric Light Association, and the hope was expressed that at the Philadelphia convention of the association, to be held in June, some part of the program would be devoted to electric signs.

Mr. George R. Hall, of the National Electric Sign Company, Jersey City, was elected temporary chairman of the meeting and a committee was appointed by him to formulate some plan whereby the society might be organized. This committee, of which Mr. Norman B. Hickox, Greenwood Advertising Company, Knoxville, Tenn., was chairman, suggested that a committee of three, consisting of sign manufacturers from distinctly different geographical locations in the country, be appointed to draw up a constitution and by-laws for the society to be acted upon at a future meeting of the delegates. For membership on this committee the following names were recommended: Mr. George R. Hall, National Electric Sign Company, Jersey City, N. J.; Mr. H. I. Markham, Federal Sign System, Chicago, and Mr. Norman B. Hickox, Greenwood Advertising Company, Knoxville, Tenn. It was recommended that the accessory manufacturers be made non-voting members and that full membership in the society be limited to those manufacturers using the Underwriters' label service. Following the discussion on the report of this committee, letters were read from Mr. E. W. Lloyd and Mr. C. H. Jones, stating that co-operation with the sign manufacturers was assured by the National Electric Light Association.

In discussing co-operation with central stations, the electric-sign manufacturers seemed to be divided generally in two classes—namely, those doing a national business and the local manufacturers, the sale of whose products is confined to the cities in which the respective factories are situated. It was brought out during the debate that the latter manufacturers are not so favorably inclined to the central stations as are the larger firms, since on account of their higher production costs they are unable to compete in price with larger manufacturers. This has led the central-station men to lend their patronage to the larger companies and has resulted in some ill feeling between the smaller manufacturers of signs and the local central-station companies. However, in general it may be said that the average sign manufacturer recognizes the central-station man as his best salesman's auxiliary and most enthusiastic local representative. It was decided that the present delegates would meet again, in Chicago, within ninety days, at the call of the chairman of the committee of three, and that at that time each sign company would be entitled to one vote upon the acceptance or rejection of the by-laws and constitution as presented at that meeting section by section.

Suit Under Sherman Law Against American Can Company

A suit has been brought by the Department of Justice of the United States against the American Can Company and its subsidiaries, alleging violation of the Sherman law. The brief of the government alleges restraint of trade and an attempt at monopoly. Dissolution of the combination is asked. Until this is effected the court is asked to enjoin the various defendants from voting or receiving dividends from the stocks of any corporations acquired by the company.

President F. S. Wheeler of the company made a statement in which he said:

"While the company regrets that the government has thought proper to bring this suit, it has no fear or misgiving as to the result. Neither in the origin of the company nor in the subsequent conduct of its business has monopoly or restraint of trade been attempted or attained. None of the methods commonly known as 'unfair competition' have been employed by the company. It has been party to no agreements or understandings, express or tacit, seeking to control or regulate prices, nor has it sought in any way to rule or dominate the industry in which it is engaged. It has no such share of that industry—only about one-third—as would enable it to rule or dominate it, even if it had the purpose to do so. Competition is wholly free and keenly active in that industry.

"The company will defend this suit vigorously and confidently, and it is the belief of its officers and of its counsel that neither the company nor its stockholders need feel any alarm or uneasiness as to the outcome."

Chicago Railway Terminal Situation

After five meetings in which plans for railway terminals had been presented by Mr. John F. Wallace, Mr. Bion J. Arnold, Mr. A. H. Wacker and others acting for various civic bodies in Chicago, the terminal committee of the City Council has voted unanimously to permit the new union station to be built on the site desired by the Pennsylvania Railroad Company, namely, in the block bounded by Adams Street, Jackson Street, Canal Street and Clinton Street. Although the vote was unanimous in favor of this site for the station, six of the twelve aldermen voted aye with the reservation that the ordinance must contain many concessions.

Among the things which have been agreed upon by Mr. John F. Wallace, technical expert of the committee, and Mr. Bion J. Arnold, adviser of the citizens' committee, are: the desirability of eventually straightening the Chicago River; the opening of several streets to provide more thoroughfares to the West Side of the city; the desirability of lowering and ultimately covering all tracks north of State Street, which would necessarily mean electrification; the desirability of establishing a technical board or commission to have jurisdiction over all future matters pertaining to railroad terminal questions but so constituted that its powers would not conflict with legislative powers of the City Council or the powers of the state board of

public utilities, and the desirability of two general stations in addition to the present Northwestern station, one of which is to be on the lake front east of Michigan Avenue and south of Twelfth Street, while the other is to be on the West Side between Canal Street and the river.

The drafting of the necessary ordinances has been taken in hand by a commission consisting of Chairman Geiger of the terminals committee, Aldermen Healy, Fisher, Bowler and Donahoe, Corporation Counsel Sexton, Mr. John F. Wallace, adviser for the City Council committee; Mr. Bion J. Arnold and Mr. Walter L. Fisher, representing the terminal plans committee; Mr. Paul Lazenby, chief engineer of the Chicago plans commission, and Mr. Robert Redfield, special attorney and chief engineer for the Pennsylvania Railroad Company.

English Officials Study Railroad Electrification

As noted elsewhere in this issue, Mr. A. H. Stanley, general manager of the London Underground Railway, is escorting through the United States a party of officials of the Midland Railway, one of the great trunk lines of England. Some interesting particulars on the plans of this company and its operating conditions were obtained by a representative of the *Electrical World* in an interview with Sir Guy Granet, general manager of the Midland company. Sir Guy said that the electrification question had become an acute one with his company, partly on account of the recent acquisition of the London, Tilbury & Southend Railway, a system with some 70 miles of route. At this time the very heavy suburban traffic of the Midland interests must be cared for on only 1½ miles of its own track, the remainder being handled over the Whitechapel and Bow extension of the Metropolitan & District division of the London Underground Railway. The problems which his company has before it, he said, are three in number. First comes the electrification of the Tilbury line because of the very congested conditions now obtaining upon it. Second, but more remote, is the electrification of the main line of the Midland Railway from London to Bedford, a distance of 50 miles. In this instance the electrification will be undertaken chiefly to build up still further the rapidly growing suburban traffic. A third proposition, and one which appears extremely attractive, is the substitution of electric for steam traction for sections with heavy freight traffic to make possible the hauling of longer trains over the heavy grades. As he expressed it, the Midland Railway passes over the backbone of England, and in the mining districts its grades are steeper than are common on British railways.

Sir Guy Granet said he had already seen the New York Central and the New Haven installations at New York and was very much impressed with them. The use of electric switching locomotives was of special interest to him in connection with his freight service. While he had come to no conclusions on the subject of system, he said, it was reasonable to suppose that the choice in each case would depend upon the kind of traffic to be served. At London, for instance, it might be desirable to choose a system of propulsion and rolling stock which could be used in connection with the local underground railways. An important quesion is that of clearances, because it would not be altogether desirable to have a class of rolling stock too large for the London tubes. However, the question of having the local underground railways serve shorter suburban sections was under consideration. The sentiment among steam railroad men in England at this time is not for the general electrification of railways, but for electrification in congested sections and for suburban lines where electric operation will permit more trains and consequent increase of commuter traffic.

It is the purpose of Sir Guy and his party to visit all the important electrifications as far as Chicago and to return to England about the end of the year. The system of which he is general manager operates more than 1400 miles of track, exclusive of 600 miles or more of a line from which the Midland Railway has running powers. Among other questions which Sir Guy will consider on this trip will be those of using steel cars in place of wooden cars, the elimination of grade crossings and the relations between the railroads and public utility commissions.

Convention of A. S. M. E.

The thirty-fourth annual meeting of the American Society of Mechanical Engineers was held in the Engineering Societies Building, New York City, Dec. 2 to 5, with an attendance totaling 750 members and 500 guests.

At the opening session of Tuesday evening President W. F. M. Goss, dean of the Schools of Engineering, University of Illinois, Urbana, made his official address, in the course of which he discussed technical education as a factor in the development of professional ideals. The speaker made a plea for better appreciation of the responsibilities and possibilities of technical education and urged the setting of even higher standards in the curricula and plans of conducting such colleges. As long as engineers in commercial pursuits can earn as much in a week as a college professor receives in a year, it is hardly likely, pointed out Dr. Goss, that the best men can be secured for the colleges. At the present time about 1000 graduates in mechanical engineering are being turned out each year by the technical schools of America.

Election of Officers

The report of the tellers in charge of the balloting for officers was then read, and the following were declared elected: President, Mr. James Hartness, Jones & Lamson Machine Company, Springfield, Vt.; vice-presidents, Mr. Henry L. Gantt, of New York City; Mr. E. E. Keller, president Detroit Insulated Wire Company, Detroit, Mich., and Mr. H. G. Reist, General Electric Company, Schenectady, N. Y.; managers, Mr. John Hunter, Union Electric Light & Power Company, St. Louis, Mo.; Prof. A. M. Greene, Jr., Rensselaer Polytechnic Institute, Troy, N. Y., and Mr. Elliott H. Whitlock, National Carbon Company, Cleveland, Ohio; treasurer, Mr. William H. Wiley, John Wiley & Sons, New York.

Following the announcement of the tellers, President-elect Hartness was called upon for an address and spoke briefly, emphasizing the pleasant personal relationships existing between members of the Society of Mechanical Engineers. During his own twenty years of membership in the body, he said, he had formed many sterling and warm friendships. A reception to the president and president-elect followed, after which a collation was served in the rooms of the society on the eleventh floor.

The business meeting of Wednesday morning was largely taken up with the reports of standing committees on society affairs and of the special technical committee on flanges, standard threads for hose couplings and pipe-thread gages.

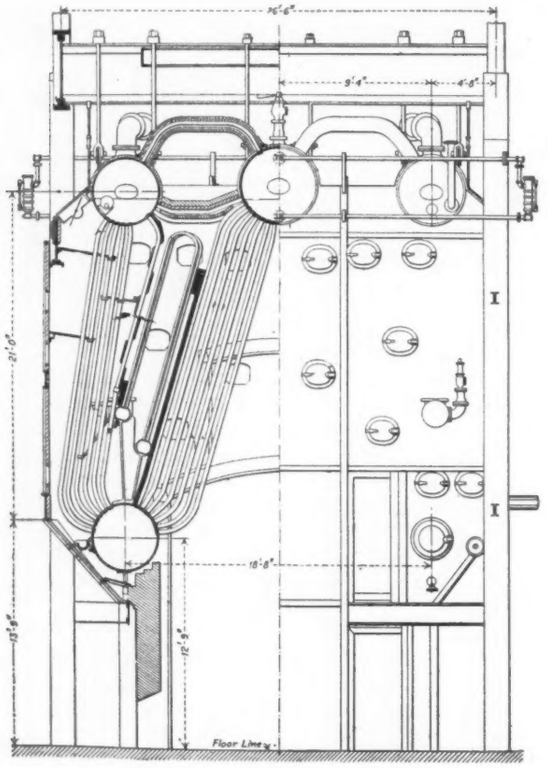
Operation of 2365-hp Boilers at Detroit

Mr. J. W. Parker, of the Edison Electric Illuminating Company, Detroit, Mich., opened the professional program with his paper presenting further data on the operation of the large boilers at the Delray plant of the Detroit company. Nine of these 2365-hp units are now in service, the oldest group covering a period of three and one-half years. In refutation of the objection which has been urged against the use of such large boilers—namely, that a considerable part of a plant's steam-generating capability may be lost by the shutting down of a single unit—practical operating records at Delray were quoted by the author. During a given three-month run of six units it was at no time com-

pulsory to put a boiler out of commission, nor was any boiler out of commission during the peak load of the day, from 4 p. m. to 6 p. m. Again, in more than a year's operation of seven boilers whose average age is two years only two tubes were replaced. Both of these faulty tubes were discovered by inspection and neither caused a shut-down.

Mr. Parker's report also discussed the methods of operating the boilers, pointing out the advantages resulting from the flexibility of these units and the extremely flat efficiency manifested. The latter is virtually a straight line from a value of 82 per cent efficiency at 60 per cent load to 78 per cent efficiency at 220 per cent load. The labor cost of firing this twelve-boiler plant is estimated at $101 per day, or 0.0076 cent per kw-hr. The watch foreman is paid 31.5 cents per hour and the fireman receives 25 cents per hour.

The closing section of Mr. Parker's paper was devoted to subjects of furnace design and stoker and brickwork maintenance. In general, the conclusions reached from



ARRANGEMENT OF GAS PRESS IN 2365-HP BOILER

practical operation of these big boilers is that in reliability they equal the turbo-generator, and that such large boiler units present possibilities of operating economy and simplicity of design which are greatly in advance of present steam-generating practice.

Discussion

Discussion of Mr. Parker's paper was opened by Mr. Alexander Dow, Detroit, Mich., who declared that the theory of the Detroit company management in installing large units had not only been to reduce floor space and increase efficiency but also to demonstrate that the payment of higher rates for boiler-room attendance would well warrant the improved results obtained. Mr. Dow advised reducing the number of firemen but improving the class of men secured for this work.

Mr. A. A. Cary, New York City, discussed comparative experience obtained with carbon-dioxide measurements and means of checking with steam-flow meters. Mr. I. E. Moultrop, Boston, Mass., declared that the operating engineer must look to his fire-room for efficiency, putting his best-paid men in that department. In Boston, he added, the steam-flow meter has been used with entire success. On the other hand, Mr. Moultrop also expressed doubt whether the value of the CO_2 recorder is as great as is generally believed. Mr. R. D. De Wolf, Rochester, N. Y., testified that he places principal reliance on steam-flow meters rather than on CO_2 records. Mr. Edward Uehling, Passaic, N. J., declared that CO_2 recorders give satisfaction if used intelligently.

Mr. William Kent, Montclair, N. J., observed that certainly at present the highest operating efficiencies are being obtained where CO_2 records are kept. He suggested, however, that a recorder of oxygen content be devised, as the proportion of oxygen present in the flue gases (ranging from 3 to 7 per cent) affords a more accurate index of the combustion conditions obtained than does the CO_2 percentage.

Mr. R. P. Bolton, New York, complimented the designers of the Delray boilers on the size of the combustion spaces provided and urged the use of a higher class of intelligence in the operating staff of station fire-rooms. Dr. D. S. Jacobus, New York, observed that a plant can be operated satisfactorily on the basis of secondary indications, provided these relations are once accurately established. Serious errors may, however, result from improper interpretation, as in the case of the engineer who maintained his CO_2 content high by copiously wetting his coal. Mr. Harrington Emerson, New York, criticised the tabulation of maintenance costs given in the paper.

Mr. D. M. Myers, New York, said that in the operation of power plants not used for utility service the lay management frequently knows little or nothing of fire-room conditions. By educating the fire-room staff without adding equipment, it is in many instances possible to achieve marked increases in efficiency. Mr. J. C. Parker, Philadelphia, Pa., reported that some of the early large double-ended boilers installed by the Philadelphia Rapid Transit Company are still in operation on the company's service.

Task-Setting for Boiler-Room Employees

At the general session of Thursday morning a paper on "Task-Setting for Firemen and Maintaining High Efficiency in Boiler Plants" was presented by Mr. Walter N. Polakov. As pointed out by the author, the possibility of accomplishment of a task is governed by co-ordination of conditions and supplies with power demand and facilities; the guidance of men in their work, and the regaining of physical losses during intervals between working periods. The desirability of accomplishment of a task set within men's possibilities requires the study of physical, psychical and social stimuli. To the first group are referred payment of bonus, better surroundings, shorter hours, sanitary conditions, etc. Psychical factors include sporting spirit, confidence in records, relationship with management, and desire to study and advance. To the last-named group belong such stimuli as the attitudes of fellow workmen and members of the family, the condition of the labor market, legal regulations, etc.

In his paper "Properties of Steam," which was read by title only, Prof. R. C. H. Heck offered a new pair of characteristic equations for steam, giving the specific volume and heat content, respectively, in terms of pressure and temperature as independent variables.

Hoisting, Conveying and Dynamic Braking

The report of the sub-committee on hoisting and conveying, of which Mr. R. B. Sheridan is chairman, presented in its report a review of existing practice and recent progress, pointing out the increase in hoisting loads to 50 tons and over; the higher speeds employed, which now exceed 2000 ft. per minute; the use of the man-trolley with self-transported operator; introduction of storage-battery trucks, extension of monorail systems, etc. The committee

urged standardization in electrical machinery as essential to the satisfaction of both the manufacturer and user.

A paper on "Dynamic Braking for Coal and Ore-Handling Machinery," by Mr. Clark T. Henderson, cited how the great increase in the use of electric motor hoists for coal and ore handling has developed dynamic-brake control for lowering to a high degree of refinement. Generally speaking, explained the author, it is not good practice to figure on obtaining lowering speeds greater than 200 per cent of the full-load hoisting speed, unless special motors are employed. Lowering speeds should be held down to even one and one-half times full-load hoisting speed if possible. The commutation of standard series-wound mill-type motors is not good if operated above 200 per cent of full-load speed. Furthermore, the energy stored in their armatures becomes too great for rapid control at high speeds.

Three-phase alternating-current motors can be connected directly to the line for reverse operation and will prevent the lowering speed from exceeding the full-load hoisting speed by more than a few per cent. The motors cannot, however, be used to slow down the load, for only this one braking speed is available. On some installations attempts have been made to obtain perfect braking control by the excitation of the stator windings of the hoist motors from a source of direct-current supply. When the stator windings are thus excited the motors act as generators and the currents set up in the rotor windings serve to retard the descending load. The exciting current required is, however, so high that if prolonged for any considerable period it will cause the winding to overheat. It has been necessary, therefore, to incorporate with these alternating-current dynamic-braking systems means for varying the stator excitation in proportion to the braking effort which the motor is expected to exert.

The later technical sessions of the convention will be reported in a following issue.

GRASHOF MEDAL TO MR. WESTINGHOUSE

On Wednesday evening before an audience that packed the auditorium of the Engineering Societies Building the Grashof Medal of the Verein Deutscher Ingenieure was formally transmitted to Mr. George Westinghouse, although the distinguished recipient was prevented by illness from being present. The actual award of the medal, as explained by Col. E. D. Meier, was made in Leipzig last summer before a brilliant company which included the King of Saxony. Geheimrat Dr. Frederick Romberg, of Cologne, Germany, as representative of the Verein Deutscher Ingenieure, made an eloquent address in his native tongue, urging that the bonds which unite American and German engineers be encouraged and strengthened. Other members of the committee representing the Verein who occupied the rostrum with Colonel Meier and Dr. Romberg were Messrs. Rudolph Hering and C. D. Waelzoldt. In the absence of Mr. Westinghouse, the medal was accepted in his behalf by President-elect Hartness.

The medal-presentation ceremony was followed by an address on "Leonardo da Vinci—Engineer and Artist," by Mr. John W. Lieb, Jr., vice-president of the New York Edison Company and past-president of the A. S. M. E. The versatility of this extraordinary savant proved to be a topic of the greatest interest, and Mr. Lieb illustrated his absorbing address with numerous reproductions from Leonardo's works, testifying to his talents as painter, sculptor, anatomist, philosopher, botanist, astronomer, mathematician, engineer and constructor.

On Thursday evening at the Hotel Astor was held the German dinner simulating one of the entertainments accorded to the society by its German hosts during the trip abroad last summer. Past-president W. R. Warner gave an illustrated lecture describing the chief events of the trip and the evening's entertainment closed with dancing in the great ballroom.

Public Service Commission News

MARYLAND COMMISSION

The Maryland Public Service Commission has received an application from the Susquehanna Transmission Company for permission to issue $286,000 first mortgage 5 per cent bonds to be used in liquidating obligations to the Pennsylvania Water & Power Company.

The Consolidated Gas, Electric Light & Power Company of Baltimore has applied to the commission for permission to issue $743,000 general mortgage 4½ per cent bonds. The proceeds are to be used in buying property, improving plant and extending the distribution system.

MASSACHUSETTS COMMISSION

The Public Service Commission has issued an order requiring all corporations under its jurisdiction to file quarterly statements of general expenses in full detail, except as excused by the board in special cases, such expenses to include in particular money paid for advertising in newspapers and periodicals, for salaries and expenses of a legal character outside the regular legal departments, for services in legislative matters, and money expended to assist or influence the nomination or election of any person to public office. The reports are to date from October, 1913.

NEW YORK COMMISSIONS

Testimony has been taken by the New York Public Service Commission, Second District, in the case involving the rates of the New York Telephone Company. Mr. A. B. Welch, commercial engineer for the New York Telephone Company, appeared as a witness on Nov. 28. He testified that 48 per cent of the business of the company was delivered to private exchanges.

INDIANA COMMISSION

The Public Service Commission of Indiana has sent to electrical utilities the final draft of the classification of accounts and forms prescribed by the commission under the new law. Statistics prepared by the commission show approximately 350 electrical utility companies of Class C, which includes utilities in towns of less than 3000 population. In Class B, towns and cities between 3000 and 10,000 in population, the total number is fifty-three utilities, and in Class A, all cities over 10,000 inhabitants, the total is twenty-five electrical companies.

The forms apply to municipal as well as privately owned utilities, and the new system is operative from July 1, 1913. The annual reports of the companies to the commission are to be made in accordance with the forms and specifications prescribed by the commission.

The forms now prescribed will provide each utility with a means of securing cost figures, under the provisions of the statute, which requires specification of cost per unit from each company.

Classifications cannot be modified or changed in any way without permission from the commission. If, however, a utility desires more detailed information with reference to any department of its business, enlargements of the classification may be made.

No attempt was made by the commission to make up all of the small forms, such as work orders and statistical information blanks. The commission announced that to introduce an entirely new set of such forms would be impossible at this early date.

"It is needless to say that all payrolls must be properly distributed as called for in the classification," the commission announced. "Material and supplies of all kinds must be charged to the proper operating or construction account when used. When purchased, these supplies must be charged to their respective storeroom accounts. All invoices or bills for goods purchased by the utility should be checked upon receipt of the goods and the invoices marked so as to leave no doubt as to the proper accounts to which they should be charged."

Current News Notes

Census of St. Louis Electric Employees.—The St. Louis League of Electrical Interests, Jovian Chapter, recently took a census of the employees in the electrical interests in St. Louis. About 75 per cent of the total number of electrical concerns in the city were willing to furnish the necessary data. The figures secured were as follows: Male employees, 13,311; female employees, 1839; total, 15,150; number of dependents, 32,832; number of concerns complying with request for information, 72.

* * *

Foreign Markets for Electric Devices.—Reports from a number of American consuls in foreign countries describing the present application of and probable demand for electric appliances in their vicinities are presented in No. 277 of *Daily Consular and Trade Reports,* issued Nov. 26 by the United States Department of Commerce, Washington, D. C. Among the countries reported on are Austria, Belgium, Great Britain, Greece, Italy, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, Ceylon, India, China, Chile and Venezuela.

* * *

Liquefied Carbon.—According to a cable message to the New York *Tribune,* at a scientific meeting held Nov. 27 at Breslau, Prof. Lummer claimed that he had succeeded in liquefying carbon by means of a 220-volt arc lamp burning in a partial vacuum. He said that under a slight reduction of pressure the carbons became semi-liquid, and that when the pressure was further diminished they became quite fluid. If the pressure is still further reduced the phenomenon of ebullition appears, but on a close approximation to a vacuum the carbons resume their solid form.

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SOCIETY MEETINGS

Public Utility Depreciation.—A paper by Mr. John W. Alvord on "The Depreciation of Public Utility Properties as Affecting Their Valuation and Fair Return" will be presented before the American Society of Civil Engineers, New York, on Dec. 17, 1913.

* * *

Efficiency Society.—A meeting of the Efficiency Society will be held at the Aldine Club, 200 Fifth Avenue, New York, on Dec. 9, at which time addresses will be delivered by Mr. Frank A. Horne, Mr. Dean Park and Miss Margaret MacKinley. The offices of the society are at 41 Park Row, New York.

* * *

New York Section, I. E. S.—At a meeting of the New York Section of the Illuminating Engineering Society to be held in the Engineering Societies Building on Dec. 11 Mr. Frank E. Wallis will present a paper entitled "The Reasons for Styles in Architecture," and Mr. Howard E. Watkins will present one on "Periods of Architecture as Applied to Fixture Design."

* * *

Fraternity of Electrical Engineering Graduates.—The national association of Eta Kappa Nu, the fraternity of electrical engineering students and graduates, will form a branch organization at Schenectady, N. Y., on Dec. 8, with thirty charter members. The formation of the branch chapter is in response to a demand made by the rapidly increasing number of members residing in Schenectady and its vicinity. At the meeting officers and committees will be selected. A paper will be presented by an engineer of the General Electric Company. It is expected that the new branch, which includes the territory in northern New York and western Massachusetts, will become one of the most active organizations of its kind in the East.

Convention of Refrigerating Engineers.—The ninth annual meeting of the American Society of Refrigerating Engineers was held at New York, Dec. 1 and 2. Among the papers presented of interest to electrical men were the following: "Electricity for Ice-Making and Refrigeration as Supplied by the Central Station," by Mr. C. H. Stevens, Edison Illuminating Company, Brooklyn, N. Y.; "The Chemistry of Raw-Water Can Ice," by Mr. John C. Sparks, New York, and "The Sterilization of Water by Ultra-Violet Rays," by Dr. Max von Recklinghausen, Strasburg, Germany.

* * *

Electric Club of Chicago.—Officers have been put in nomination for next year's administration of the Electric Club of Chicago as follows: President, Mr. Alfred R. Bone, Chicago Telephone Company; vice-president, Mr. William C. Berry, Commonwealth Edison Company; treasurer, Mr. F. W. Harvey, Jr., *Popular Electricity and the World's Advance;* secretary, Mr. Howard Ehrlich, *Electrical Review and Western Electrician;* managers, Messrs. H. L. Judd, Public Service Company of Northern Illinois; R. I. Phillips, Pitt Engineering Company; A. R. Dean, Federal Sign System (Electric); Stephen Gardner, Westinghouse Electric & Manufacturing Company, and Fred M. Rosseland, Chicago Telephone Company.

* * *

Electrical Topics Before Coal Operators.—At the winter meeting of the Coal Mining Institute of America held at the Fort Pitt Hotel, Pittsburgh, Pa., Dec. 4 and 5, several papers presented dealt with topics of electrical interest in connection with coal mining. "Safeguarding the Use of Electricity in Mines" was the title of the paper by Mr. C. G. Brehm, electrician Oliver Snyder Steel Company, Uniontown, Pa., while "Stray Electrical Currents" was the topic discussed by Mr. W. F. Elwood, consulting chemist, Greensburg, Pa. Mr. H. H. Clark, electrical engineer United States Bureau of Mines, closed the technical program with an address on "Portable Electric Mine Lamps," an abstract of which is given elsewhere in this issue.

* * *

Testing Horizontal Low-Head Water Turbines at Elkhart, Ind.—On Nov. 24 Mr. Lucius B. Andrus, of South Bend, Ind., read a paper on "The Testing of Horizontal Low-Head Water Turbines at Elkhart, Ind.," before the Western Society of Engineers in Chicago. Results obtained were not given, but a chart presented showed maximum efficiencies of 83 per cent on one of the Leffel wheels operating under a head of about 18 ft. A partially floating rocker ring built especially for this installation in connection with the Lombard governor was sketched and explained by Mr. Andrus. The following men took part in the discussion: Messrs. D. W. Roper, Chicago; W. B. Jackson, Chicago; M. G. Lloyd, Chicago; H. E. Goldberg, Chicago, and F. G. Vent, Chicago.

* * *

Electric Cooking Facts.—At the regular Chicago Jovian Luncheon held on Dec. 1, in the Hotel Sherman, Mr. G. A. Hughes, of the Hughes Electric Heating Company, read an interesting and instructive paper on electric cooking in which he declared that the electric range is now an economic competitor of the gas and coal ranges in all cities where a cooking rate of 4 cents per kw-hr. or less is in effect. In answering the questions of the members following the reading of the paper many enlightening facts regarding the electric-cooking rates of central-station companies in various parts of the country were brought out. It was stated that within the last week the electric-service company at Jacksonville, Fla., had reduced its rates to 2 cents per kw-hr. for cooking. The record for electric ranges, it was reported, is now held by Winnipeg, where the rate is 1 cent per kw-hr. and more than 100 ranges are in use.

Central Station Practice of Windsor, Vt.

The development of a small progressive central-station system supplying electricity to a manufacturing and rural community in the upper Connecticut Valley

THE attractive New England village of Windsor, Vt., situated on the east-central border of the Green Mountain State, about 140 miles northwest of Boston, has lately achieved prominence as the "port of entry" of President Wilson when en route to and from his summer home at Cornish, N. H., and as the nearest business center to the "summer capital," the home of a growing colony of residents distinguished in the larger business and professional life of the nation and the seat of varied manufactures, the town supplies a territory for the development of electric service along diversified lines. The central-station requirements are provided by the Windsor Electric Light Company, whose system, although small in rating, has lately been modernized along highly efficient directions.

The population served by the company totals about 2500. The distribution circuits cover the greater part of Windsor and extend into the adjoining town of Cornish, on the opposite side of the Connecticut River. At Windsor is the plant of the Windsor Machine Company, manufacturing the "Gridley Automatic" lathe and employing about 425 persons. The shops of this concern occupy a ground area of about 2 acres. The village also contains a canning factory, a glazing concern, a machine shop, a shoe factory, three banks, water-works and a sewerage system. Two garages are prominent consumers of electrical service, and the Vermont State Prison, situated in the town, is lighted from the company's mains. The central-station system has been in operation about fifteen years, but its modernization began about five years ago under the controlling interest of Mr. Frank A. Kennedy, of the National Biscuit Company, who resides in Windsor. About 300 customers are on the company's lines. The gross income is now about $5.60 per capita.

The company operates two hydroelectric plants and a steam auxiliary, all located near the center of Windsor on Mill Brook, a tributary of the Connecticut River draining a portion of the watershed of the Mount Ascutney region, in which the town is situated. The upper hydroelectric plant is about half a mile above the lower installation, the latter being situated within a few hundred feet of the steam auxiliary station. These last are known as the main plant of the company. Supplementary energy is derived by purchase at certain periods of the year from the Windsor Machine Company, which operates a 500-kw steam-turbine generator in its factory service. From October to May the service of the Windsor Electric Light Company can usually be carried entirely by the main plant, at which time the generating capacity in the upper hydroelectric station is utilized almost entirely by a motor-driven sawmill in its immediate vicinity. During this period no energy is purchased from the Windsor Machine Company, but secondary energy is sold to the latter at 0.5 cent per kw-hr. The main and upper plants, and also the machine company's plant, are interconnected by tie lines, but, with the exception of the sawmill service above mentioned, all distribu-

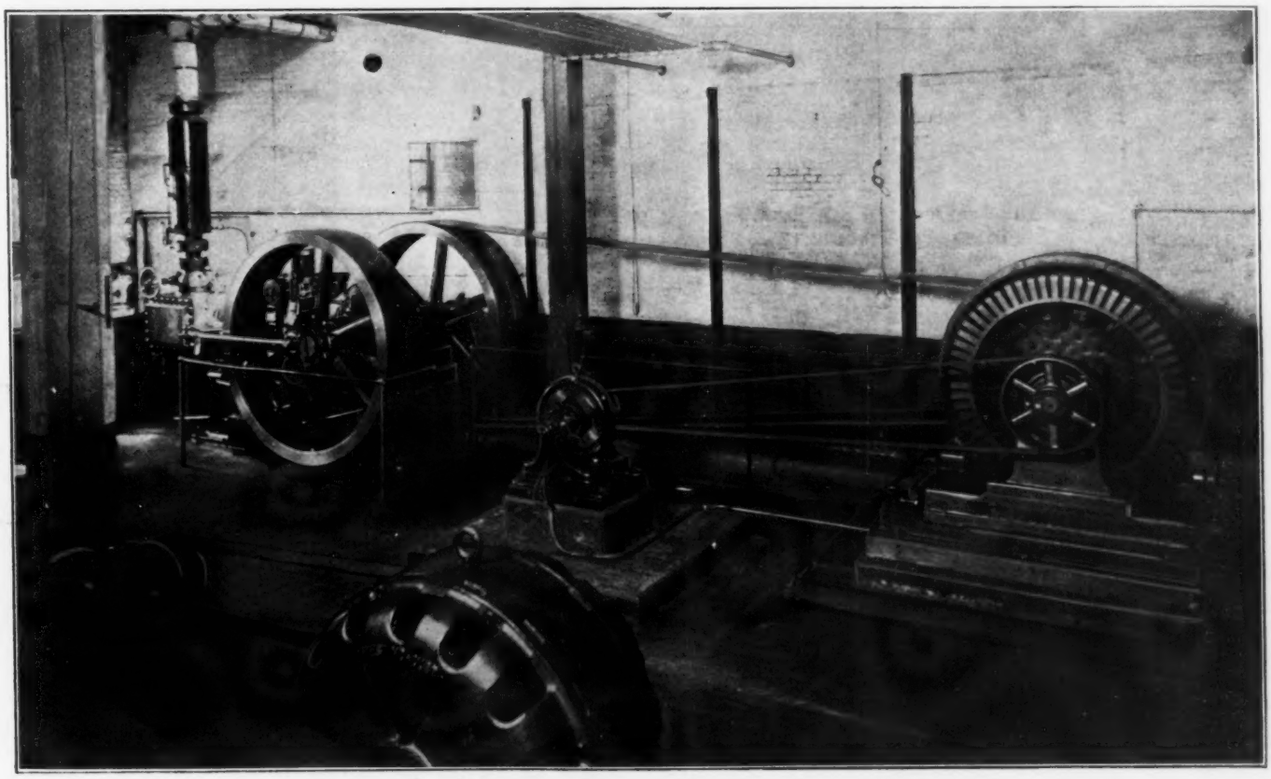
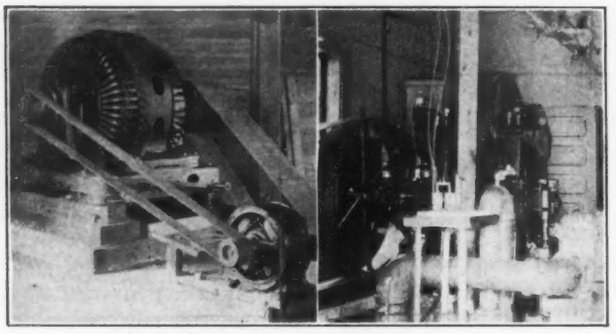


FIG. 1—AMES ENGINE AND GENERATOR, MAIN PLANT, WINDSOR, VT.

tion is effected from the main plant of the central station as a controlling point. During the period when the hydroelectric service is available at normal flow of the stream the tie line between the upper plant and the main station is usually opened, leaving the sawmill machinery operating solely upon the upper station. The Mill Brook watershed extends back about 20 miles into the lower foothills of the



FIGS. 2 AND 3—WATERWHEEL-DRIVEN GENERATOR IN MAIN PLANT, AND MOTOR-DRIVEN PUMP, WINDSOR WATER-WORKS

Green Mountains, and while there is no storage capacity worthy of the name on the stream, the flow is sufficient through the above period to enable the generating machinery to be handled efficiently and to require very little supplementary steam service. The waterwheels in both plants can be run twenty-four hours per day for about nine months of each year.

When the dry season comes, about the middle of May, the main and upper plants are operated in multiple from 6 p. m. to 1 a. m., after which the lower hydroelectric plant carries the load until morning. About midsummer the waterwheels have to be shut down, and energy is then purchased between 7 a. m. and 6 p. m. from the steam-turbine plant of the machine company at a rate of 1.2 cents per kw-hr. After 6 p. m., when the machine company's plant is shut down, the load is carried by an Ames steam engine belted to a 200-kw generator in the auxiliary steam plant of the main station until 1 a. m., when the load during the remainder of the night is carried by an Erie steam engine belted to a 60-kw generator. The system is sufficiently flexible to provide auxiliary steam power to either the main station or the machine company's plant at all times when the flow of water is too small for economical or reliable operation.

The upper plant, which was installed in 1911, contains a 75-kw generator belted to a 110-hp Rodney Hunt horizontal turbine with draft tube, operating under a 40-ft. head. Water is taken from a millpond by a 37-in. penstock leading to the wheelhouse, which is about 175 ft. below a stone dam 700 ft. long, 15 ft. thick at the base, 5 ft. wide at the top and 40 ft. in maximum height. This dam has recently been faced with concrete to a thickness of 12 in. on the upstream side and a new installation of headgates has been made. The field excitation of the generator is provided by a 3-kw, 125-volt direct-current machine. Regulation is cared for by a Lombard type "M" governor belted to the wheel shaft, and a Tirrill regulator is installed for generator voltage control. The generator and switchboard are housed in a 15-ft. by 17-ft. room, the switchboard being of the single-panel type and carrying, besides the usual voltmeter, ammeter and indicating wattmeter, field rheostat and switch, three oil switches by which the generator may be thrown upon the local bus, the main plant connected with the bus through the tie line, and the sawmill installation supplied with energy from either source. The generator rheostats are mounted on framing behind and at the top of the switchboard, and all wiring is run in conduit, with condulet outlets. A guard which completely incloses the generator belt is a noteworthy feature of the operating room. Prior to the installation of the upper plant it was necessary to open the floodgates at the dam at night in order to supply the lower station with water, losing the head now utilized. The tie-line switch is of the automatic type, operating upon predetermined overload.

The waterwheels at the main station are housed in old mill buildings which were formerly features of a mechanically driven manufacturing plant. From a stone dam near the company's office and auxiliary steam plant a 48-in. steel penstock leads to one turbine, which is 300 ft. distant, a 24-in. branch penstock supplying another turbine from a point near the lower end of the first. The waterwheels are of the Rodney Hunt design, one being rated at 200 hp and belted to a 150-kw generator and the other a 50-hp outfit belted to a 40-kw generator, the heads being respectively 40 ft. and 39 ft. The turbines are of the horizontal type, each having a draft tube, and in each case the generator is placed above the waterwheel. The larger unit is equipped with a 42-in. balanced pulley or flywheel drive weighing about 1700 lb., the smaller wheel being provided with a similar pulley weighing 1200 lb. The exciters are belt-driven and are rated at 4 kw and 1.5 kw respectively. All the waterwheels owned by the company are equipped with Lombard pressure gages with low calibrations, the instruments being piped into the wheel casing and indicating at all times the pressure conditions on the penstocks at the wheel intakes. In case an intake rack or screen at either dam becomes clogged with leaves or other débris, the drop in pressure is shown soon enough for the operators on duty to remedy the conditions, and there has been a marked improvement in service by this utilization of instruments. The company has found that the most economical use of water is to be had by operating the 50-hp and the 110-hp wheels and their respective generators at the lower and upper plants in multiple when water is scarce, and by relying upon the 200-hp wheel when it is plentiful.

The wheels at the main plant are controlled by a single

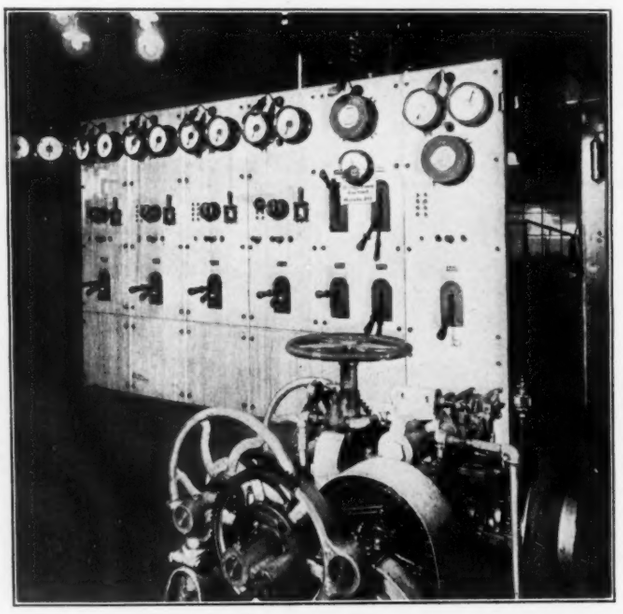
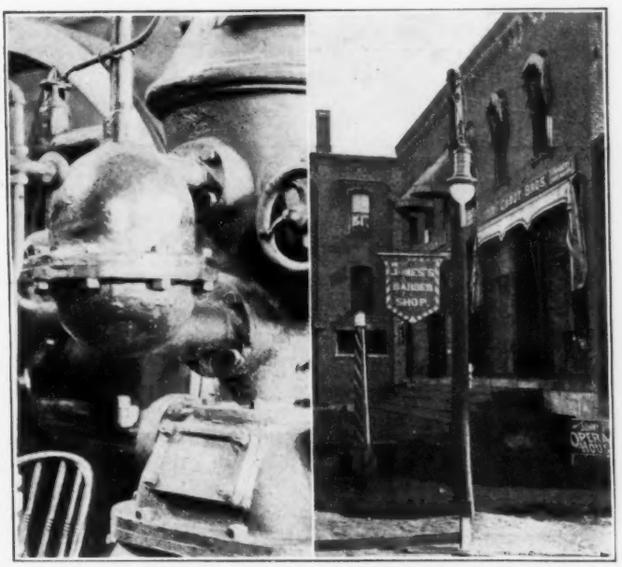


FIG. 4—SWITCHBOARD IN MAIN PLANT, WINDSOR, VT.

Holyoke hydraulic governor, which may be connected to the gate mechanism of either turbine. This governor is placed in the switchboard room of the station, and instead of the ordinary mechanical drive from the wheel shaft is driven by belting from a 10-hp, three-phase, squirrel-cage-type induction motor of 220 volts rating on the basement

ceiling. Through step-down transformers this motor is connected across the station busbars, and it controls the gate opening by its responsiveness to changes in frequency, the latter, of course, being governed by the speed of the generators. This arrangement saved investment in two governors and also makes it unnecessary to heat the wheel houses in winter. The gate-operating service is secured by the use of the town water supply piped to a hydraulic ram on the governor through a reducing valve that cuts the pressure down to 35 lb. per sq. in. Tests have shown that the gates on either wheel can be opened by a 2.5-hp motor, but a 10-hp motor was used in order to avoid the drop in the speed of opening the gate due to induction motor slip. The gate-operating cables are run from the main station through a tunnel to the wheels, and no difficulty is found in securing first-class control despite the distance involved. The cables leading from each generator are run directly to the main switchboard, and the waterwheel units are operated almost as easily as if located in the same room with the auxiliary steam-engine equipment.

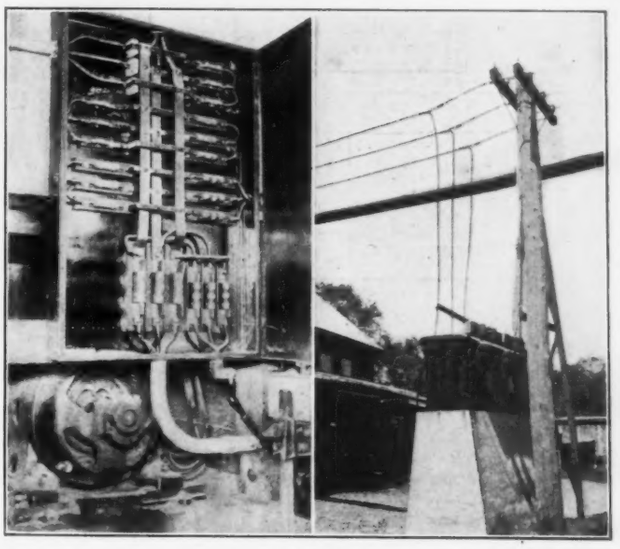
All the generators owned and operated by the company are of the Westinghouse company's make and are wound for 2300-volt, three-phase, 60-cycle service. During the past five years the system has been changed from a 133-cycle, single-phase installation to a 60-cycle, three-phase and single-phase property. The former waterwheel generators at the lower plant were located in the building housing the engine-driven machines, and all the generating units were driven by belts and shafting through clutches which were constantly giving trouble and wasting energy. The betterment program which has resulted in the present installation called for the sale of four 133-cycle generators and the purchase of four 60-cycle machines, with the elimination of the long shafting between the wheels and the generators. Two of the new generators were belted to the engines. Under the new arrangement tests show that twice as much power can now be obtained from the waterwheel driving the 150-kw generator as was available when this wheel was connected to the old line shaft leading to



FIGS. 5 AND 6—ELECTRIC CONTACT ON VACUUM BREAKER OF CONDENSER, MAIN PLANT, AND MULTIPLE FLAME ARCS FOR STREET LIGHTING

the main plant, with its incidental friction and alignment difficulties. Within the past few years the company's overhead lines have also been rebuilt according to the recommendations of the committee on overhead-line construction of the National Electric Light Association.

The auxiliary steam plant at the main station consists of an 18-ft. by 72-in. Kendall horizontal return tubular boiler with overhung front, equipped with both butt and strapped joints and two engine-driven generators, one rated at 60 kw and the other at 200 kw. The former is driven by a 12-in. by 16-in. Erie non-condensing simple engine with throttling governor and the latter by a 16-in. by 16-in. Ames horizontal, simple condensing engine, each being



FIGS. 7 AND 8—DISTRIBUTION PANEL BOX, AND TRANSFORMER MOUNTING, BUENA VISTA SAWMILL

supplied with steam at about 85 lb. pressure. Refuse from the sawmill, supplemented by South Fork Pennsylvania bituminous coal costing $5.65 per long ton, forms fuel for the plant. The freight charges on the coal are $3.35 per ton. The company has found the use of higher priced coals the most economical practice. Tests show that this coal develops a heating value of about 14,000 heat units per lb. With the Ames engine and its generator operating at 80 kw average output, the auxiliary steam plant consumes about 6 lb. of coal per kw-hr.

The Ames engine exhausts into a Blake-Knowles jet condenser in the engine room, which is about 36 ft. by 38 ft. in dimensions. Primary and secondary heaters are located in the engine room raising the feed-water temperature to 130 deg. and 180 deg. Fahr. respectively. The Ames engine exhausts into the primary heater, which is of the Jacobs type, through an 8-in. pipe, and the condensate is discharged into the brook. The primary heater is drained by a Bundy trap. The Erie engine is piped for exhausting either into the Jacobs heater or into the atmosphere. Feed water is handled by a Knowles pump, with a Hancock inspirator for emergency service. Either the town supply or the river may be drawn upon for boiler-feed purposes. A special protective device has been installed on the vacuum breaker of the condensing system in the form of an electric contact on the valve spindle, so that if water from the pond tends to flood the exhaust end of the engine cylinder an electric gong will be rung in time to enable the operating force to prevent damage. A 23-in. vacuum is usually maintained in the plant, this being the highest economical vacuum adapted to the existing equipment combination.

The main switchboard of the system is 12 ft. long, contains six panels, and is equipped with the usual apparatus for generator and feeder control at 2300 volts. A separate panel is provided for each generator at the main plant, including the two waterwheel-driven units, and each contains receptacles by which the current can be read on a single instrument in any leg of the three-phase system, an ammeter, an indicating wattmeter and field-control rheo-

stat handle. One panel is provided with a watt-hour meter integrating the output of all the generators and motor-starting and automatic oil switches in circuit with the municipal pumping plant. The sixth panel is a tie-line panel connected with the upper station and contains, among other apparatus, a double-scale indicating watt-meter reading to 120 kw which shows the direction and

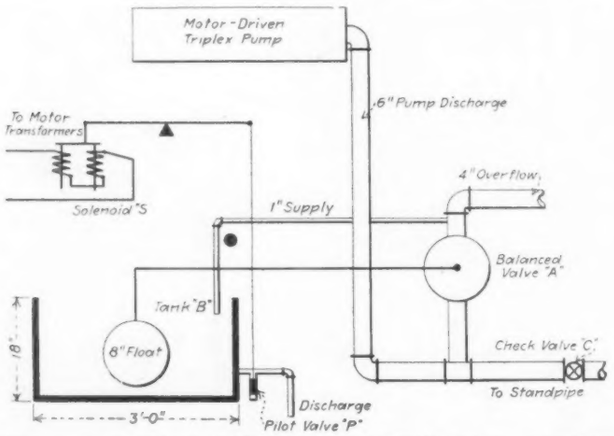
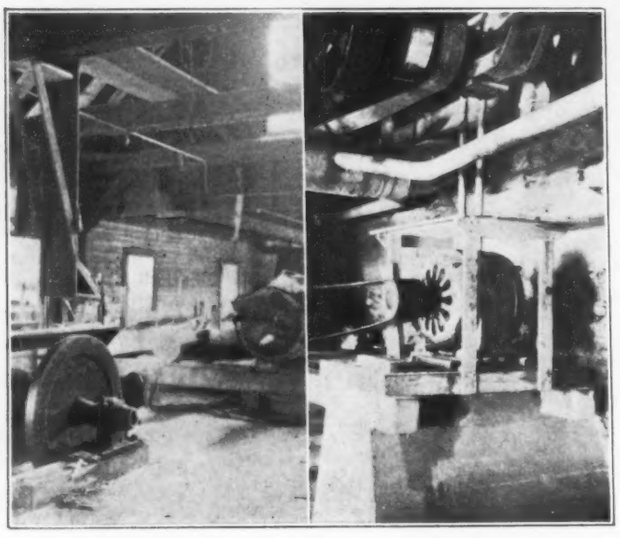


FIG. 9—AUTOMATIC REGULATION OF PUMP LOAD, WINDSOR MUNICIPAL PUMPING PLANT

amount of power interchange between the two plants at all times. The oil switches are attached to a framework at the rear of the switchboard, there being a clearance of 3 ft. at the rear to facilitate safety in working. Behind the board all wiring is insulated with flame-proof wire for 10,000-volt service. Throughout the plant the wiring is run in conduit. A single set of buses was considered sufficient for the service. The operating staff of the company consists of one superintendent, one day engineer, one night engineer, one transient fireman, one electrician, who also handles line work and meter setting, and in summer one helper on line work.

The upper and lower plant are connected by a No. 6



FIGS. 10 AND 11—SAWMILL INTERIOR, AND TYPICAL MOTOR DRIVE FROM SAWMILL BASEMENT

copper three-phase tie line, one-half mile long, and the main or lower station is connected with the machine company's turbine plant transformers by a No. 4 copper three-phase line 1500 ft. long. The two waterwheel-driven generators in the main plant are connected with the switchboard by No. 4 three-phase lines. The machine company's turbo-generator delivers energy at 550 volts to three 100-kw transformers used exclusively in the tie-line service to and from the central station.

The local distribution from the main plant consists of a single-phase No. 6 arc lamp circuit and three No. 4 three-phase, 2300-volt lines running to the center of the village for general lighting and power service. These lines are operated in open delta, the transformers for local service being balanced between the outer leads and the middle lead. So-called "rough-and-ready" service, as for electric ranges, moving-picture machines, single-phase farmers' motor applications and other demands characterized by low power-factors, are cared for across the outside legs of the system, which avoids unbalancing and greatly improves the regulation on the lighting lines taken off the intermediate leg and the corresponding outer wire. The company's standard poles are of chestnut and cedar, 25 ft. to 30 ft. long and spaced 125 ft. apart. The butts and tops are treated with carbolineum and copper for a length of 2 ft. each. On the company's lines are at present seventy transformers, representing an aggregate capacity of 321 kw. The house voltage is 110. Special attention has

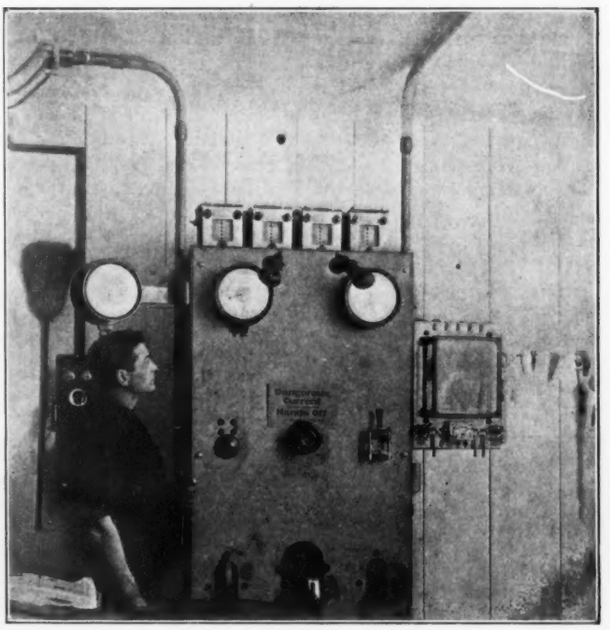


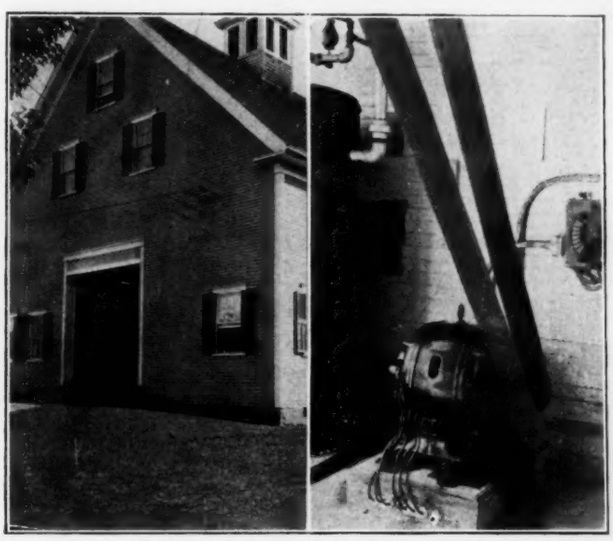
FIG. 12—SWITCHBOARD, UPPER HYDROELECTRIC PLANT

been given to utilizing diversity factors in distributing from transformers, the most striking instance being the operation of no less than seven motors in the business district from a single bank of two 5-kw transformers. These motors have a total rating of 24 hp and are listed as follows: One 3-hp, operating newspaper press, mainly afternoon service; one 2-hp, operating print shop all day; one 5-hp, running woodworking plant in all-day intermittent service; one 3-hp, operating blacksmith shop; one 3-hp, operating compressor and lathe in garage; duplicate of the last-named in another garage, and one 5-hp, operating laundry machinery in the daytime and in the evening. These transformers are connected in open delta, and the motors run off the outer legs.

The company charges 15 cents per kw-hr. up to an energy consumption of 20 kw-hr. per month for commercial lighting, with reduction in steps down to 6 cents minimum for over 350 kw-hr. The minimum service charge is $1 per month. Motor-service prices begin with a base rate of 7.5 cents per kw-hr., discounted by 10 per cent steps up to 50 per cent off for users of 2000 kw-hr. per month. The minimum charge is $1 per month per service. The company does not rent motors but sells them

at wholesale prices and on a three months' instalment plan. Energy for electric heating will shortly be sold at 4 cents per kw-hr., notably for household tank service on a separate meter. A representative installation is a 15-gal. tank in a doctor's office, which utilizes 500 watts continuously at this rate. New customers are all taken on meter service and the rate for electricity used in signs is the same as for commercial lighting. Automobile sparking batteries are charged at a price of 75 cents per cell. About 100 electric flatirons are on the system.

The company secured a contract for municipal water pumping about three years ago and handles this work effectively on an off-peak basis. The town water supply is derived from springs issuing from the mountain side just without the village, and the distribution is effected from a 275,000-gal. standpipe located about a mile away from the springs. The water was formerly pumped to the standpipe by a Laidlaw-Dunn-Gordon steam pump in a station at the spring site. The present equipment for performing this service consists of a 30-hp, 220-volt, three-phase Westinghouse induction motor with external starting resistance at the pump house and an auto-starter at the main generating plant, the motor being belted directly to a 7-in. by 10-in. Deane vertical, triplex, double-acting



FIGS 13 AND 14—TYPICAL FARM-SERVICE ENTRANCE, AND KENNEDY MOTOR-DRIVEN PUMPING PLANT

pump capable of delivering 420 gal. per minute against 115 lb. pressure and operating at 44 r.p.m. The motor operates at 850 r.p.m. and can be started either from the pump house or the power plant. Ordinarily it is started from the latter. An interesting home-made equipment is installed at the pump house to enable the load to be assumed gradually by the pump and thus to cut down the starting current. It was found that the motor could not start the pump against the head involved, so the arrangement shown in the accompanying drawing was provided by the company's superintendent. When the operator at the power house starts the motor the float in the tank *B* is at the bottom and the balanced valve *A* in the pump discharge line open. The solenoid *S* is energized with the motor, and the movement of the cores into the coils closes the pilot valve *P*. The motor begins to pump water into the overflow pipe through the balanced valve, and water also flows into the tank *B* from the pump discharge through the 1-in. supply pipe shown. The float rises gradually, slowly closing the balanced valve and increasing the load on the motor as water begins to flow past the check valve *C* against the standpipe head. When the float reaches its full height of travel, the balanced valve is closed, cutting off further flow into the tank and throwing the full pumping load upon the motor. As long as the motor continues in operation the solenoid plunger holds the pilot valve *P* closed, but in case the motor stops or if current is cut off the pilot valve opens, emptying the tank, lowering the float and opening the balanced valve again for a repetition of the operation described above.

FIGS. 15 AND 16—GARAGE SIGNS AT WINDSOR, VT.

The contract provides for six years' service, with optional extension by the town at the stated price for a total life of ten years. The company is required to pump 75,000,000 gal. or less in a year at a flat rate of $1,500, and all pumpage in excess of this amount is paid for at the rate of 3 cents per 1000 gal. The contract is saving the town $700 a year above the cost of operation by the

FIG. 17—PORTABLE MOTOR-DRIVEN SAW

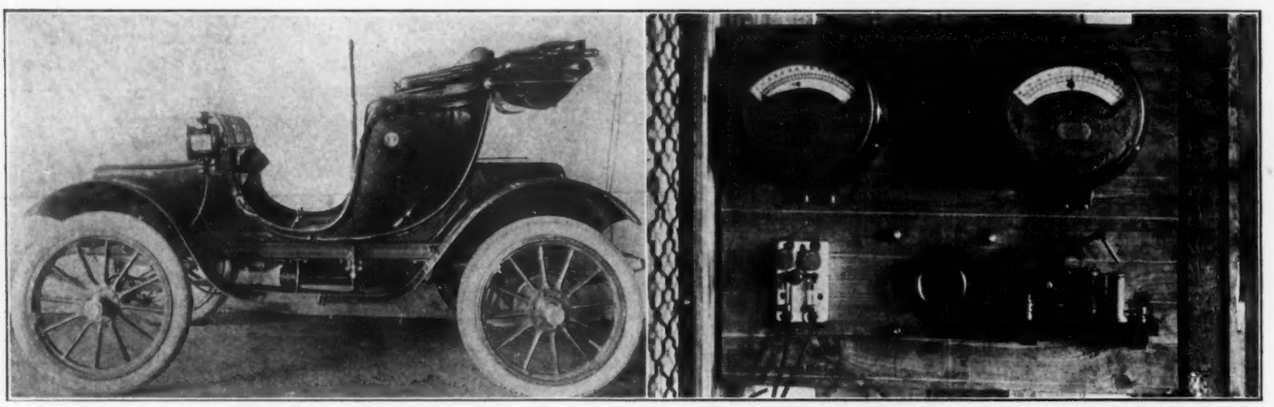
former steam plant, and this enables the municipality to retire one five-hundred-dollar bond yearly on the water debt. The central-station company maintains the plant and owns the electrically operated apparatus. It operates the steam plant for four half days per year to keep it in proper condition. The demand of the motor service is about 30 hp, and the plant is operated on typical off-peak service,

usually from 9 a. m. to 1 p. m., from 2.30 to 5 p. m., from 10 p. m. to 1 a. m., and from 5 a. m. to 7 a. m. At the standpipe float contacts are installed which ring a bell in the main generating plant when the water level approaches within about a foot of the top and when the top is reached. At the pumping station are two receiving basins of concrete with special drainage facilities, these having a combined capacity of 70,000 gal.

A number of country estates on the company's lines use electricity in pumping service. On the Evarts estate, for example, a 3-hp, 110-volt General Electric single-phase motor replaced two Olds gasoline engines operating by line shaft and belting two double-acting "Bulldozer" reciprocating pumps. The motor-driven outfit delivers water against 50 lb. pressure and is automatically controlled by a float switch. The cost of electrical service is about $7.50 per month against $10 with gasoline at 16 cents per gal. Off-peak use is made of the motor, by agreement with the company. It is frequently found in cases of this kind that the plant owner installs two gasoline engines in order to be sure of his reasonably constant service, whereas with electricity a single motor is invariably relied upon to do the same work.

On the Kennedy farm motors are used in the operation of the local pumping plant, in oat grinding, creamery service, ensilage cutting, grist-mill operation, bone, corn and vegetable grinding, the motors being flexibly arranged for diversified work. Chicken incubators consuming 100 watts each in heating service are run continuously for several weeks in the brooding season, which is between February and May. The pump house on the farm is a frame building with a concrete floor, and it contains a single-cylinder, double-acting geared Deming deep-well pump and a 4.25-in. by 6-in. Blaisdell duplex air compressor delivering air for air-lift service against a pressure of about 125 lb. per sq. in. There is a deep well with a 275-ft. lift, the water pipe being 5 in. in diameter and the internal air pipe 1.25 in. in diameter. This plant is group-driven by a 10-hp Wagner 220-volt, three-phase motor equipped with a Cutler-Hammer starter, a 2-ft. by 5.5-ft. air-receiving tank being located in the pump room. This plant pumps water four hours daily on an off-peak schedule to a 50,000-gal. storage tank, giving a head of 75 ft. for the farm service. The pumping plant has a rating of 20 gal. per minute and provides an excellent day load while it is in operation. On a representative farmers' line three farmers purchased a 10-hp Wagner motor, a 10-kw transformer and an ensilage cutter on a co-operative basis, and in utilizing this equipment they pool their labor and move the apparatus about according to immediate local needs.

The equipment of the Buena Vista sawmill, near the upper generating station, consists of 167 hp in induction motors operated on a 220-volt, three-phase secondary service from three 25-kw transformers mounted on a concrete pier. There are eleven motors in this establishment, ranging in size from 2 hp to 50 hp, and the mill runs daily from 7 a. m. to 6 p. m. The transformers are supplied with energy by a short tie line leading to the upper generating station. Their mounting is a distinct advance over the usual pole support accorded equipment of this type. The concrete pier on which the transformers stand is about 6.5 ft. high, 8 ft. long at the bottom, 2 ft. wide at the top and 3.5 ft. wide at the bottom, and it is set into the ground for a depth of 5 in. The transformers are not attached in any way to the pier, but the hangers are utilized as a support for a 3.5-in. by 4.5-in. cut-out bar to which the primary leads are brought from taps on an adjacent pole. The secondary leads to the mill are provided with a 2.5-in. by 0.875-in. wooden spreader on the mill side of the bank. The pier was made of concrete of four parts cement and one part gravel and was erected by three men and a one-horse team working two days, the labor cost being about $20 and the cost of material $10. The usual timber support rots away in a few years, necessitating early replacement, and the use of concrete is considered by the company cheaper in both first and ultimate cost. The motors at the sawmill are listed as follows: 50 hp, driving 54-in. board saw; 25-hp, S. A. Woods four-sided planer; 20-hp, lath mill; 15-hp, shingle mill; 15-hp, board planer; 5-hp, gaging machine; 15-hp, edger; 10-hp, small board planer; 10-hp, group drive of woodworking lathe, boring machine, buzz planer, small circular saw and log conveyor; 3-hp, cutting-off saw; 5-hp, slab conveyor; 5-hp, drag saw; 2-hp, blower, and a 10-hp motor which operates a cutting-off saw mounted on a small truck which is run around the yard and used in sawing slab wood. There are four outlets in the yard placed in pole boxes, as shown in the accompanying photograph, and this arrangement saves re-handling slabs in the mill and economizes in time and labor. The motor installation at the mill cost about $2,000, of which $1,700 was the motor investment and the balance the wiring cost. It saves the Buena Vista company about $8 per day, the cost of electricity being $35 per month. Two cords of slabs were formerly burned daily by the mill for its steam service, and this material is now sold.



FIGS. 18 AND 19—PRESIDENT WILSON'S ELECTRIC ANTOMOBILE ON CHARGE AT LIGHT COMPANY'S PLANT, AND TEMPORARY CHARGING PANEL INSTALLED FOR IT

The majority of the motors at the saw mill are installed in the basement, either on the ceiling or on concrete piers. A typical installation is that of a 25-hp Wagner motor belted from the basement to a Woods four-sided planer. The motor is mounted on a wooden platform bolted to a concrete pier 4.66 ft. long, 3 ft. wide at the bottom, 2 ft. wide at the top and 3 ft. deep. A 1000-lb. flywheel is

mounted on the arbor of the 54-in. circular saw to absorb the fluctuations in energy demand. A view is also shown of the distribution box at the center of motor service at the mill, with inclosed fuses and conduit wiring.

The street-lighting service includes twenty-four 500-watt, 7.5-amp arc lamps of the alternating-current inclosed type, operated 2100 hours yearly, or from dusk until 1 a. m. nightly, at a price of $50 per year per lamp. A number of electric signs are in service, two of the more representative ones being shown. The Windsor Garage sign exemplifies the trade-mark of this concern, which is found on many highways in northern New England. It is 20 ft. high, and is marked by a 4-ft. 6-in. arrow with ruby-glass front and back, the interior of the arrow containing two 25-watt and five 2-cp, 110-volt tungsten lamps. The arch at the top of the sign proper contains five 25-watt lamps and the standard six lamps of this size. The sign is 8 in. deep and is mounted on a 5-in. iron pipe set into a circular concrete foundation in the sidewalk. It is operated nightly until 1 a. m. The Windsor Auto Company's sign consists of a 30-in. by 60-in. panel illuminated from above by three 20-watt tungsten lamps on each border, the lamps being 15 in. apart on centers and the wiring in 0.75-in. conduit. The sign is supported by 2-in. pipe, with wire bracing and

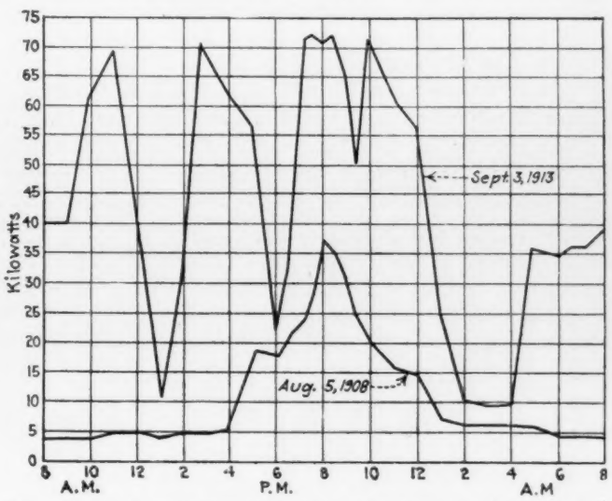


FIG. 20—LOAD CURVES SHOWING GROWTH OF BUSINESS BETWEEN 1908 AND 1913

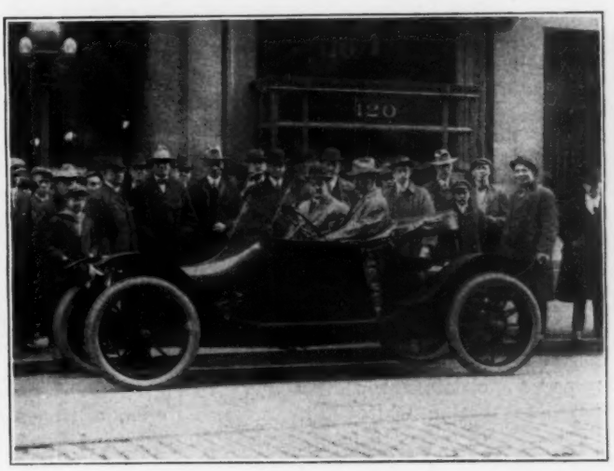
turnbuckle adjustments. A trial installation is being made of a multiple flame arc, shown in the accompanying photograph, for street lighting in the center of the town, and the yearly charge for this service will probably be $58.

President Wilson's electric automobile, shown in the accompanying photograph while on charge, is cared for regularly by the company at $1.50 per charge, and to meet this service demand a temporary switchboard panel with ammeter, voltmeter and automatic cut-out was built as shown. Practically no other electric-vehicle business has developed in the territory as yet but it is expected that the good example set by the nation's chief magistrate will be followed in due course by other summer residents of the community.

Typical load curves showing the growth of the company's business since 1908, when the day load was first cultivated, are reproduced. The first curve was plotted from data taken one week after the day service was begun, and the second, for Sept. 3, 1913, shows the influence of the electric pumping load as carried on an off-peak basis, when compared with the station log sheet for the day, also reproduced. The total connected load on the system is about 250 hp. The gross earnings of the company five years ago were $5,000 per year, and the plant was losing money. By the physical improvements and progressive commercial policies reviewed above the income has been brought to $14,000 and the concern placed on a paying basis. The officers are: President, Frank A. Kennedy; secretary, Edward Anderson; superintendent, Richard P. Osgood, all of Windsor.

Chicago-Milwaukee Run of Electric Roadster

On Nov. 9 Mr. J. S. Codman, sales manager of S. R. Bailey & Company, Boston, made a run from Chicago to Milwaukee, using the Bailey electric roadster in which Colonel Bailey completed his remarkable tour from Boston and New York to Chicago, as reported in these columns Nov. 8 and Nov. 15. Accompanied by Mr. Harry Salvat, of the Fashion Garage, Mr. Codman left the Auditorium Hotel, Chicago, at 9:09 a. m. and arrived at the corner of Wisconsin and Water Streets, Milwaukee, at 6:17 p. m. The furious northerly gale, which was so destructive to shipping on the Great Lakes, retarded the progress of the car to a considerable extent. A small charge was given to the Edison battery at Waukegan and a charge at the rate of 200 amp for one hour was taken at Kenosha. Mr. Codman made the trip back to Chicago by himself, leaving Milwaukee on Nov. 11 at 8:25 a. m. and arriving at the



ELECTRIC ROADSTER WHICH MADE BOSTON-NEW YORK-CHICAGO RUN

Illinois Athletic Club on Michigan Avenue, Chicago, at 4:19 p. m., having covered 98.8 miles for the day. A picture of the Bailey roadster which made the Boston-Chicago run, with Colonel Bailey in the left-hand seat, is shown herewith. The photograph was taken in front of the office of the Commonwealth Edison Company at 120 West Adams Street, Chicago.

Storage Reservoir as Adjunct to Hydroelectric Plant

The Great Northern Power Company, of Duluth, Minn., is constructing a large storage reservoir on the Cloquet River, about 20 miles north of that city, which will furnish water for its hydroelectric plant during the dry seasons. The reservoir is situated in flat, marshy country, so that, with the 40-ft. multiple-arch dam which is being constructed, a pond area of about 12 sq. miles will be obtained. Two 8-ft. tubes are being built in the dam to be used as penstocks for future hydroelectric development in this vicinity. For the time being, however, the reservoir will be used only for storage. Mr. E. S. Johnson, of St. Paul, Minn., is the contractor and Mr. Gardner S. Williams, of Ann Arbor, Mich., is consulting and designing engineer.

Visual Acuity in White Light

By M. Luckiesh

The effect of the spectral character of light on visual acuity, or the ability of the eye to distinguish detail, has been extensively investigated by Dow, Bell, Broca and Laporte, Rice, the writer and others. It has been quite thoroughly established that the spectral character of light is a great factor in influencing visual acuity. Dr. Louis Bell[1] showed that detail appears more defined under mercury-vapor light than under that of the tungsten lamp. The writer[2] showed that acuity is greater in monochromatic light than in light of the same color and luminosity though of extended spectral character. This advantage of monochromatic light is generally conceded to be due to chromatic aberration of the refractive apparatus in the eye. In another paper[3] the writer showed that acuity is greater in monochromatic yellow light than in monochromatic light of any other wave-length, the observations having been made at the distance of 1 m and at equal luminosity. The different results obtained by some observers are no doubt attributable chiefly to the fact that they used lights which differed in spectral character and partly to the variable distances at which the observations were made. A simple lens does not focus all rays at the same point. The rays of short wave-length such as violet or blue suffer greater refraction than the red rays, hence are focused nearer the lens than those rays of longer wave-length. Thus the eye must accommodate to a greater or a less degree for lights which differ in color.

This can readily be verified by viewing a line spectrum on a ground glass. At a normal distance the eye naturally focuses for the brightest lines, which are usually in the yellow-green region. As the eye approaches the lines the red, yellow and green lines begin to blur in the order indicated, until when very close it can accommodate only for the blue rays. At a great distance red rays are more readily focused. There are other methods of showing that the eye is not achromatic.

At the time the former work was done the writer obtained some data regarding acuity in tungsten light compared to that in white light and also to monochromatic light. There seems to be no reason for expecting greater acuity in tungsten light or daylight than in purely monochromatic light, yet some have suggested such a possibility. For this reason observations were recently repeated and the results verify what would be deduced from the lack of achromatism in the eye. The green mercury line (546μμ) furnishes an especially desirable illumination in this case because of the elimination of difficulty in accommodation, as it lies at the position of maximum luminosity in a spectrum in which energy is equally distributed. The green mercury line was separated by suitable absorbing screens and one side of a wedge was illuminated by the monochromatic green light. The other side was illuminated by a tungsten lamp operating at 1.25 watts per candle. First a photometric match was made and then acuity measurements were obtained with the Ives acuity object at one meter distance. The tungsten lamp was then balanced against "artificial daylight" and acuity readings were taken. Next the acuity object was set at the mean value of visual acuity obtained under the monochromatic light and the illumination from the tungsten lamp was increased until acuity in tungsten light was the same.

The mean values of a number of different sets of observations with varying light sources are shown in the table which is printed herewith.

Visual acuity has been reduced to the Snellen scale. The equivalent brightness of the test object after allowing for its absorption (for it consists of black lines on clear glass) is shown in the last column and expressed in terms of the brightness of a white (magnesium oxide) surface illuminated by a certain number of meter candles. It is seen that at 10 meter-candles (approximately 1 ft.-candle) acuity in tungsten light is 11 per cent less than in the monochromatic light. At an illumination of 85 meter-candles the difference was found to be only 6 per cent. This result is in accord with former unpublished data which indicated a greater difference in acuity under the two lights as the illumination decreased. The second group in the table shows that the illumination required in tungsten light is 280 per cent of that required in monochromatic light for visual acuity on the Snellen scale of 1.28. In other words, the 11 per cent difference in acuity found at an illumination of 10 meter-candles disappears only when the tungsten illumination is increased by 180 per cent.

While many interesting data can yet be obtained relating to acuity and the spectral composition, the foregoing measurements close a gap left since the former work. The measurements show that there is little difference between tungsten light and artificial daylight in revealing detail. Artificial daylight which closely approximates average daylight in spectral composition was used because of the ease of controlling it.

It seems firmly established at least that when the accommodating power of the eye is not strained acuity in white light is less than acuity in monochromatic light of the same photometric brightness.

A note on the effect of yellow-green glasses in reducing glare under the open sky and in increasing the ability to distinguish fine detail may be of interest. The acuity object was set up out of doors under the open sky, the observer and instrument being shaded from the sun, which was in the rear. Acuity readings were made with the test object viewed against the sky. The observer wore no hat and the glare from the sky was of course a maximum. Alternate sets of readings were made with and without the yellow-green (Akopos) glasses which were of plane glass. Without the glasses the observer experienced painful discomfort when attempting to distinguish the fine lines of the test object.

ACUITY AND BRIGHTNESS WITH DIFFERENT LIGHT SOURCES

Source	Acuity (Snellen Scale)	Equivalent Brightness of Test Object (MgO Surface Illumination, in Meter-Candles)
Green mercury line	1.28	10
Tungsten lamp	1.14	10
Artificial daylight[4]	1.11	10
Green mercury line	1.28	10
Tungsten lamp	1.28	28

Every reading made in this case indicated lower acuity than with the colored glasses and the readings fell off very rapidly. Acuity dropped gradually for the twenty minutes during which the observations were being taken in both cases, but when the observer did not wear the glasses the decline in acuity was much more rapid. The mean values of acuity in the two cases showed a difference in acuity of 11 per cent in favor of the Akopos glasses. Only one series of observations was taken, but the results were so definite that there can be no question as to the decrease in glare and increase in acuity under these particular conditions. The glasses also eliminate the purple and blue haze, and thus their use results in clearer distant vision.

The writer acknowledges his indebtedness to Mr. A. Shapero for assistance rendered by him with the apparatus which was used in making the various tests described in this article.

[1] *Electrical World*, May 11, 1911, page 1163.
[2] *Electrical World*, Aug. 10, 1911, page 450.
[3] *Electrical World*, Nov. 18, 1911, page 1252.
[4] *Electrical World*, May 4, 1911, page 1092.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Exhibition Case for Drug Stores

In a large Western city the contract department of the electric-service company proposes to place in drug stores attractive glass showcases containing small exhibits of domestic electric appliances, such as heating pads, vibrators, coffee percolators, shaving mugs, toasters and the like. The plan is to give the druggist a percentage on all sales effected, while the fixture provided with schowcase lighting should add to the attractiveness of the store.

Electric Pumping for Chickasha, Okla.

The Chickasha Gas & Electric Company has just closed a five-year contract with the city of Chickasha, Okla., for the supply of energy to operate electric pumps in the city water-works. Squirrel-cage induction motors will be used to drive Worthington centrifugal pumps. The total cost of the electrical equipment was $11,200, including buildings, piping, foundations and installation. Compared with this the outlay for the steam equipment, complete with boilers, was $17,650, showing an advantage of about 50 per cent in favor of electric drive from the standpoint of first cost. In addition, savings in operating expenses, interest and depreciation amounting to more than $1,800 per year are estimated by Mr. C. G. Johnson, of the Chickasha Gas & Electric Company, who arranged the contract with the city.

Central-Station Publicity at Atlanta, Ga.

To prospective customers no better argument can be presented than the successful experience of others with central-station service. Effective use has been made of this principle in shaping the local advertising of the Georgia Railway & Power Company, of Atlanta, Ga., for which Mr. Milt Saul has charge of publicity.

Recently a campaign of full-page display advertisements appeared in the Atlanta newspapers describing conspicuous institutions and enterprises using central-station service. This campaign was based on the assumption that prospective customers would be impressed with the information that the larger enterprises, notable for their success in the commercial world, had found this service the most economical and reliable method of obtaining power and light. The effort was made to select a conspicuous example in each class of industry or institution. The results obtained more than justified the expenditures for this campangn, for the first full page had scarcely appeared in the daily papers when several prospective customers asked to open negotiations, and by the time the campaign was well under way the contract department had not only signed contracts with these but had awakened similar desires in several enterprises that had theretofore appeared absolutely hopeless as prospective customers. These also finally entered into contracts for service. "It cannot be claimed, however," adds Mr. Saul, "that these conspicuous examples were signed up solely as the result of this newspaper advertising. To the ability and cleverness of the newspaper department the accomplishment is principally due. The advertising merely fertilized the field, as it were. And in its final analysis this is about all that can be expected of any advertising."

This newspaper campaign is now to be supplemented by the publication of a handsome booklet describing and illustrating the principal large central-station customers' installations in Atlanta. Although it is planned to issue an impressive and expensive booklet, the latter's circulation will be restricted to quarters where it is likely to prove decidedly effective. Later the publicity department will compile literature describing the great steam and hydroelectric plants "behind" its service so that the customer may feel the fullest assurance in the operating and reserve capacity which the company has available.

Electric Delivery Causes Sale of Horses

A Chicago firm of horse dealers advertised not long ago as follows: "Marshall Field & Company's Horses for Sale.—On account of electric machines being installed by this firm we are authorized to sell 125 head of their horses." The house of Marshall Field & Company is one

THE DAILY NEWS, MONDAY, AUGUST 25, 1913.

HORSES, CARRIAGES, ETC.

MARSHALL FIELD & CO.'S HORSES FOR SALE.

ADVERTISEMENT ANNOUNCING SALE OF HORSES

of the largest users of electric wagons and trucks in the United States, having about 200 vehicles in service or on order. The Commonwealth Edison Company, in advocating use of electric vehicles, has taken advantage of the horse sale to preach the gospel of the electric vehicle in newspaper advertising as shown herewith.

The Power Cost in the Artificial Ice Factory

The large part played by the factor of power cost in the operation of an artificial ice factory was pointed out by Mr. C. H. Stevens, of the Brooklyn Edison company, in a paper presented by him before the recent meeting of the Eastern Ice Association in New York City. In many cases the cost of energy in ordinary manufacturing operations is as low as 1 per cent of the total cost of putting out the finished product, so that under such conditions a manufacturer can afford to give little heed to the cost of operating his power plant.

But in ice-making, where the energy cost may be as high as 50 per cent of the total, the power item is worthy of the utmost consideration, and cheap energy, therefore, becomes most important. Hence, where the manufacturer has a complete plant of his own he must devote much of his time to studying methods and means of obtaining low operating costs. This naturally diverts his attention from the actual development and extension of the ice-making business. Such condition, of course, can be bettered by avoiding the

problems of isolated-plant operation, and purchasing service from the central station. This idea had received little practical encouragement until the advent of the raw-water system of making ice, which makes it no longer necessary to use the distillate obtained from the exhaust of the engine. The central-station people are also in a position to offer special rates, provided that the ice-making plants are not operated during the high peak loads between 4 p. m. and 9 p. m. of November, December, January and February. This is a slack period for the ice manufacturer, and it is accordingly to his advantage from an economical standpoint to have central-station service.

Brick-Plant Savings with Motor-Operated Clay Excavator

The plant of the Cherokee Brick Company at Macon, Ga., has a daily output of 100,000 common bricks and 30,000 faced bricks. Its clay mine is situated about 1.5 miles from the plant and is worked by a Bucyrus electric drag-line excavator, which has been in operation about seven months with great success.

Before the installation of the electrical equipment the clay was mined and loaded on dump cars by a steam shovel located in the clay pit, but high water frequently put this outfit entirely out of business, closing down the plant for considerable periods each year. The steam shovel required four men, two on the machine and two on the ground. Because, also, of the limited service of this shovel, two locomotives and trains were required to keep the plant supplied with clay. In addition, the presence of the shovel in the clay pit required the laying of track through the pit for the operation of trains. Upkeep of this track, with the frequent shifting required, proved very expensive.

The new electric drag-line equipment has effected some remarkable economies. The excavator is located on the bank above the clay pit and its operation is unaffected by weather conditions. The track through the clay hole has been eliminated, and in place of the eight extra track men previously required only three are now needed to keep the track in proper repair. On account of the larger capacity and greater working range of the excavator, together with its greater accessibility, one locomotive with its crew of

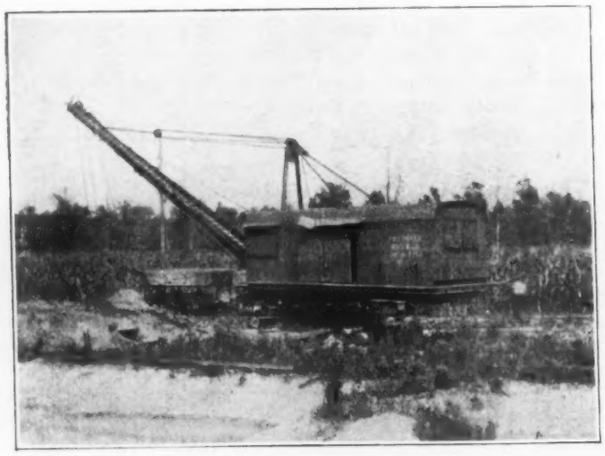


FIG. 1—MOTOR-DRIVEN DRAG-LINE EXCAVATOR

two men has been done away with, and the cars are now "placed" by means of the drag-line bucket with the aid of a snatch block. In addition, the expense of hauling coal and water to the steam shovel has been eliminated.

This particular excavator is the only one of its kind in existence, according to Mr. W. L. Southwell, of the Central Georgia Power Company, which furnishes energy for its operation. The excavator is provided with a 45-ft. boom and a 1.25-cu. yd. bucket. Its electrical equipment consists of three Westinghouse three-phase, 550-volt, 60-cycle motors. Hoisting is done by a 50-hp wound-rotor motor, while a similar 20-hp motor is used to operate the turntable and for swinging the bucket. The latter motor is equipped with a multiple-solenoid control designed for the

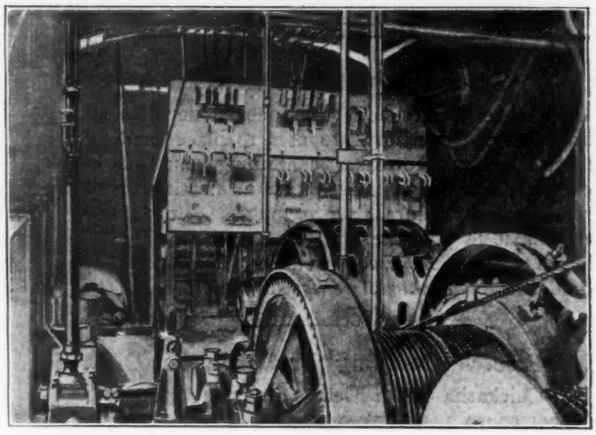


FIG. 2—MOTOR AND CONTROL EQUIPMENT IN EXCAVATOR CAB

automatic acceleration of the motor. A 2-hp squirrel-cage motor driving a small centrifugal air-compressor furnishes air for the main hoisting gear and for the brake cylinder for the bucket-tipping drum on the boom.

Energy is supplied by the Central Georgia Power Company at 6600 volts, three 20-kva transformers being employed to reduce this pressure to 550 volts. These transformers are protected by multi-gap lightning arresters, bomb fuses and air-cooled choke coils.

The record of this Macon excavator indicates an energy consumption of approximately 0.7 kw-hr. per cubic yard of clay mined and loaded on the cars. This is equivalent to about 1.1 kw-hr. per 1000 bricks manufactured. The great saving in the cost of energy, labor and maintenance and the freedom obtained from shut-down will, it is estimated, pay for the complete outfit in from one year to two years.

The Cherokee Brick Company is also using 170 hp in electric motors in the operation of its plant and has recently contracted for power and equipment for the latter's complete electrification requiring 580 hp in motor rating.

A Stove Manufacturer's Testimonial

Electrical energy purchased from the Union Electric Light & Power Company is used exclusively in the large establishment of the Charter Oak Stove & Range Company, of St. Louis. A letter from Vice-president Lester Dana of that company, telling why the company buys electricity rather than makes it, is of general interest. It reads as follows:

"The Charter Oak Stove & Range Company prefers your service to the generation of its own power, chiefly for the following reasons. The supervision of a troublesome department is eliminated. The ease with which additions or subtractions from the power equipment are made without material increase in investment is most important to us. Under the old method our greatest economy was to operate our plant to its fullest capacity. The addition of a machine which would require as little as 20 hp would under these circumstances compel a serious increase in our power equipment, while a corresponding decrease in the amount of power used would not save us anything at all. We are willing to pay for what we get, and we want to get exactly what we pay for."

Rapid Development in Southern Minnesota

H. M. Byllesby & Company, Chicago, took over the management of the gas and electric properties at Faribault, Northfield and Cannon Falls, Minn., in December, 1909, forming with these utilities the nucleus of what is now the Faribault division of the Consumers' Power Company. At that time the total electric customers of all the properties numbered 1569. Arrangements were shortly made for the construction of a water-power on the Cannon River at Cannon Falls, having an initial capacity of 1500 hp. This was completed early in 1911, and transmission lines from it now traverse 125 miles, serving the original properties and those which have since been added.

Results in the electric department show a high degree of development, particularly in the growth of motor business. In January, 1913, the towns of Morristown, Waterville, Janesville and Zumbrota were added to the lines of the company. The increase in population served (including the new towns) for the four years was 37 per cent, but the customers increased 82 per cent, kilowatts lighting load 97 per cent, horse-power in motors 498 per cent, and the total kilowatts for all purposes 167 per cent. There are 203 miles of pole line, as compared with 40.2 miles in February, 1910.

There is now one meter to every 6.6 of population served, as compared with 8.9 in February, 1910. Receipts per meter have increased 20 per cent. The output for the week ended Nov. 4 was 82,420 kw-hr., an increase of 74 per cent over the corresponding week of 1911.

Power Required for Motor-Driven Farm Machinery

Since most farm operations are essentially seasonable in character special motors are not usually required to drive each particular machine. Advantage has been taken of this diversity by a number of farm owners who have electrical installations by mounting one or more motors on skids or trucks so that these portable units can be moved about to operate machines in the various barns, stables and fields.

TABLE I—ENERGY CONSUMPTION TO THRESH GRAINS

Kind of Grain	Yield per Acre		Kw-hr. to Thresh 1 Ton	Kw-hr. to Thresh 1 Bushel
	Tons of Grain and Straw	Bushels of Grain		
Oats	1.99	73.6	2.62	0.070
Barley	2.27	49.9	2.36	0.108
Wheat	1.97	27.9	2.27	0.160

TABLE II—SIZES OF MOTORS TO DRIVE FARM MACHINES

Machines	Hp	Machines	Hp
Feed grinders (small)	5	Grain graders	0.25
Feed grinders (large)	15	Grain elevators	3
Ensilage cutters	15–20	Concrete mixers	5
Shredders and huskers	15	Hay hoists	5
Threshers, 19-in. cylinder	15	Root cutters	2
Threshers, 32-in. cylinder	40	Cord-wood saws	5
Corn shellers, single-hole	1	Wood splitters	2
Power shellers	15	Hay bailers	7.5
Fanning mills	0.25	Oat crushers	5

The motors are provided with runs of cables ending in plugs which can be attached to fused connection blocks mounted at convenient points about the farm.

Last year at the University of Illinois Experiment Station, Urbana, Ill., tests were made, with the assistance of the General Electric Company's staff, to determine the energy consumption required to thresh various grains. The threshing machine used had a 28-in. cylinder and a 42-in. separator and was driven by a 15-hp motor. While the energy required to thresh a bushel or volume-measure of grain was found to vary greatly, the consumption in terms of tons handled was fairly constant. The results obtained are reproduced herewith in Table I.

Table II lists the sizes of motors recommended for operating standard farm machines. A single-hole sheller with a sacker attachment, driven by a 1-hp motor, requires about 0.025 kw-hr. to shell a bushel of corn, shelling at the rate of 26 bushels per hour. Test of a 25-bushel grain elevator capable of unloading 25 bushels of corn in three minutes has shown that 45 bushels can be elevated 19 ft. at an energy consumption of 0.1 kw-hr.

Window Displays at Joliet, Ill.

A number of attractive and striking window displays have recently been exhibited in the show windows of the Public Service Company of Northern Illinois, which yearly awards a loving cup to its local office making the best exhibition. In each case the windows were trimmed by members of the commercial department, and the points taken into consideration in judging their respective merits were, in order, attractiveness, originality and advertising value in relation to the company's business.

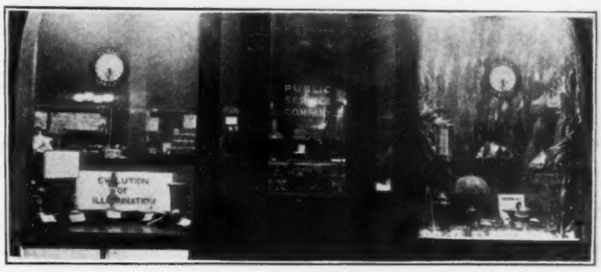


FIG. 1—WINDOW DISPLAYS IN JOLIET (ILL.) OFFICE PUBLIC SERVICE COMPANY

During the Hallowe'en season the Joliet office made a feature of a Hallowe'en window, displaying copper-finished electrical appliances among pumpkins, jack-o'-lanterns and cornstalks, while the slogan "Do It Electrically" appeared in miniature lamp letters in the foreground. Another window traced the evolution of lighting from the sperm lamp of Roman times down through the different stages of the candle, oil-wick lamp and carbon-filament electric lamp to the modern tungsten unit. Another section which attracted particular interest from the passing public was a rustic scene with a glowing camp fire illuminating the imprints of an electric iron. At one side was a small sign reading, "The trail of the electric iron

FIG. 2—"THE TRAIL OF THE ELECTRIC IRON LEADS TO EVERY MODERN HOME"

leads to every modern home," and a path was shown leading through the woods to a miniature house lighted from a tiny but perfectly constructed central-station pole line.

But of all the recent window displays at Joliet the most unique and fascinating, according to Mr. Fred H. Scheel, of the company, was the window reproduction of the National Lincoln Highway. The course of the miniature road was lighted by ornamental lamp-posts each bearing the symbol of the highway. The city of Joliet was one of the first to boost the construction of this highway and during the company's window demonstration held a public parade to stimulate interest in the movement for a national road across the Illinois prairies. The window display showed an old oxen road, while a tiny electric train encircled the Lincoln Highway, passing back and forth through rock tunnels and signaling the crossing by a tap on the window. A billboard at the side of the road bore the electric company's advertisement and a realistic rail fence added interest to the collection of Lincolnia in the window.

FIG. 3—COMMEMORATING THE LINCOLN HIGHWAY AT JOLIET, ILL.

Flood of Applications for Service Owing to Building Construction

During the last few months the Edison Illuminating Company of Detroit has received a flood of applications for service which it attributes to the increasing number of buildings, especially residences, being constructed. Ever since Detroit became prominent as a manufacturing center there has been a phenomenal growth in the central-station business of that city. Records show that about 76,000 electric meters belonging to the Detroit company were in use on Nov. 1 in all kinds of service—industrial, commercial and residential. The total connected load at that time was 136,773 kw, of which 48,400 kw consisted of motors and the remainder of lamps.

The accompanying table gives an idea of the increase in connected load so far this year. These figures represent the actual net increase in the number of meters on the lines, taking into account removals and transfers. The first column shows by months the total gain in meters connected; the second column gives the percentage of increase for each month over the same month last year, and the third contains the percentage of increase for each month over the preceding month.

INCREASE IN NUMBER OF METERS CONNECTED, EDISON ILLUMINATING COMPANY OF DETROIT

Month	Total Gain Since Jan 1, 1913.	Per Cent Gain Over Same Month Last Year	Per Cent Gain Over Preceding Month
January	1,133	71	71
February	2,120	100	83.3
March	3,205	37.2	65.6
April	4,713	54.8	62
May	6,097	15	48.3
June	7,483	24.8	43
July	8,931	38	42
August	10,569	25	39
September	12,517	28	37
October	14,594	30	36.4

In September 5214 applications and in October 5754 applications for service were received. Of these about 66 per cent were for residence lighting. The actual gain in meters installed during those months amounted to 1948 and 2077 respectively. It is estimated that there are about 92,000 residences in Detroit, and about 58,000 of these are now connected to the central-station lines.

About thirty solicitors are employed to canvass the residence districts. Besides obtaining new business in this way, many applications are also received at the main office. These applicants fill out blanks, which, twice a day, are sent to the order department where the wiremen receive instructions concerning the work to be done. In this way the applications are quickly filled and delays are avoided for the customers.

An unusual amount of rebuilding and remodeling of store fronts has taken place recently in Detroit, and such changes have generally been accompanied by extensions of the electric service.

For increasing residence consumption the Detroit Edison company favors the electric flatiron. About 10,000 flatirons were sold last year. The average income from a flatiron at the Detroit 4-cent rate is about 40 cents per month, so that the distribution of flatirons over the system is a desirable factor in increasing residence revenue.

Utilizing Grocery Stores in Percolator Campaign

Grocery stores were utilized with good results in the electric percolator campaign recently conducted by the Commonwealth Power Company, Jackson, Mich. Along with the monthly lighting bills, 3500 descriptive folders on percolators were sent out to as many customers. Advertisements similar to the one shown herewith were also published in the newspapers. Going from one grocery store to another, a young woman demonstrator served doughnuts with coffee made in an electric percolator. All that the electric-service company had to furnish were two percolators. The demonstrator was paid by the proprietors of a local bakery as they were benefited by the increased demand for doughnuts. Each grocer's co-operation was secured by using the particular brand of coffee which he wished to push. Three days were spent in each store, and considerable interest in the devices was aroused among those who witnessed the demonstrations. Five-cup, seven-cup and nine-cup percolators were sold, each at a reduction of $1 below the original retail prices.

THE OLD FAMILIAR RULE

is one heaping tablespoon of coffee for each cup wanted and ONE FOR THE POT. There is

A NEW RULE—THE ELECTRIC RULE

—which is one tablespoon of coffee to each cup and NONE FOR THE POT. Be sure to try a cup of that delicious coffee made in an electric percolator at M. & F. Lincoln's Grocery Store, 206 William Street.

THE ELECTRIC SHOP,
Commonwealth Power Company.

Advantage was also taken of the number of people visiting the central-station office during the last three days of discount on lighting bills to conduct similar demonstrations in the appliance salesrooms, thus renewing interest in the percolators, which many of the customers had previously seen demonstrated in the grocery stores.

Illumination and Wiring

Portable Electric Mine Lamps

The use of portable electric mine lamps and the specifications for such lamps as suggested by the United States Bureau of Mines were the topic of an address delivered by Mr. H. H. Clark, engineer in charge of electrical investigations for the bureau, before the Coal Mining Institute of America at Pittsburgh, Pa., Dec. 5.

Portable electric mine lamps, it was pointed out, represent a comparatively new development in America, although they are already used extensively in European coal mines. As long ago as 1887 600 portable lamps were installed in a colliery in South Wales. In a recent competition held in England 195 different portable electric mine lamps were entered. At present, as well as for the last five years, American manufacturers and mine operators have been displaying great interest in the development of electric safety lamps. The Bureau of Mines advocates their adoption because of the resulting reduction in fire and explosion hazards. While actual tests have shown that the glowing filaments of electric lamps are capable of igniting explosive gas mixtures in case of globe breakage, it has also been proved that sparks at emfs less than 6 volts will not ordinarily ignite the mine gas. The bulbs in permissible mine lamps should be so protected that they cannot be broken while the filaments are glowing at temperatures sufficient to ignite explosive mixtures.

Among the general requisites suggested for a satisfactory portable miner's lamp are reliable and sufficient illumination, lightness and compactness, low cost of operation and maintenance, avoidance of spilling of electrolyte, etc. As minimum quantitative requirements for a satisfactory safety lamp, the Bureau of Mines offers the following specifications:

Intensity of light at all times, cp	0.4
Flux of light at all times:	
For hand lamps, lumens	3.0
For cap lamps, lumens	1.5
Time of burning per charge, hours	12
Average life of bulbs, hours	300
(Not more than 5 per cent to have less than 250 hours' life.)	
Average life of batteries, hours	3600
Variation in energy consumption of bulbs, per cent	10
Angle of reflector, deg	100

Six mine lamps were recently submitted to the Bureau of Mines for test. Of this number three were accepted and with certain changes approved as permissible for use in gaseous mines. The following are brief descriptions of the lamps tested:

The safety feature of the Ceag lamp, which is designed for hand service, consists in suspending the lamp bulb between two spiral springs, so that if either the bulb or the glass dome that surrounds it becomes broken the lamp circuit will be opened. During a number of smashing tests both the outer dome and the lamp bulb were shattered, and in nearly 40 per cent of the cases the filament remained uninjured but was prevented from igniting the surrounding explosive gas by the operation of the safety devices.

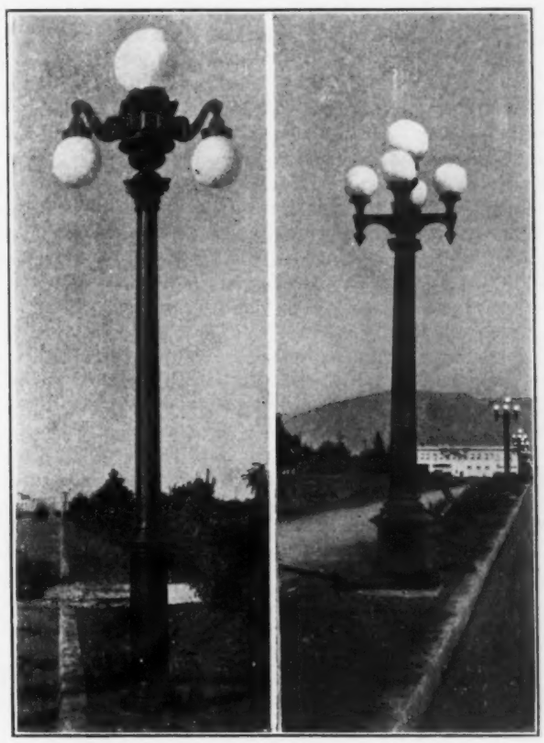
The Hirsch lamp, designed for cap service, is provided with an open-circuiting device which protects the lamp against blows from the front. A slip of glass mounted across the bull's-eye holds in closed position an open-circuiting spring which is released on breakage of the glass. Protection from other directions is afforded by constructing the headpiece of three concentric metal shells, the inner and outer being connected to the positive and the intermediate shell to the negative terminal of the battery. Any injury which could break the lamp bulb will jam these shells together, short-circuiting the battery and extinguishing the filament.

The Wico lamp, which is designed for cap service, has the bulb held in its socket by a wire stirrup against the pressure of springs, which act to eject it should the stirrup be removed or the spring broken.

In conclusion, as pointed out by the speaker it would be superfluous to suggest to mining men that anything to be used underground must be well made. Under this head should be considered, therefore, simplicity of design, strength of parts and fastenings, design of moving and removable parts, and the design and construction of electrical circuits and contacts.

Ornamental Lighting of a 30-Mile Boulevard Near Los Angeles, Cal.

To light the 15-mile section of boulevard lying in the region of Owensmouth, Marion and Van Nuys, Cal., which are within a radius of 15 miles of Los Angeles, 375 handsome tungsten standards have just been installed. The roadway already illuminated includes Sherman Way, West Sherman Way and North Sherman Way. A fourth link of state highway will soon be finished, completing 30 miles of remarkably lighted and splendidly paved highway encircling half of the San Fernando Valley. In all 600 elec-



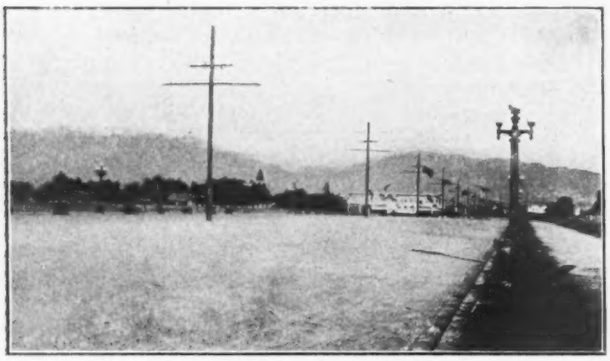
TUNGSTEN STANDARDS FOR BOULEVARD AND COUNTRY SECTIONS

troliers will be required, and the total cost of installation will be about $70,000.

A feature unusual in a lighting installation not within the limits of an incorporated city is that all of the circuits are installed in underground conduit. In the sections where the boulevard traverses towns or cities five-lamp standards are used with the lamps pointing upward. In the country districts three-lamp standards are employed with the center lamp upright and the two side lamps inverted. In the case of the city-type standard, the top lamp burns all night while the four side lamps are extinguished at 1 a. m. In installing the underground system no damage was done to the excellent roadway, the conduits being driven beneath the paved surface in each case.

The electroliers were furnished and installed by the Llewellyn Iron Works, of Los Angeles. The first installa-

tion contract was awarded to the Pacific Underground Construction Company, the second to the Newberry-Bendheim Company and the third to the B. F. Kierulf Company. The Southern California Edison Company both maintains and



THREE-LAMP STANDARDS ON BOULEVARD

furnishes electrical energy for the electroliers, including renewals of lamps and globes and also the painting and washing of the standards.

Mixing Colors in Light Versus Colors in Pigments

In making his color designs the architect invariably thinks in terms of colored pigments instead of in terms of colors of light, said Mr. Bassett Jones in an address on "The Lighting of Colored and Ornamental Surfaces and Its Relation to Artificial Illumination," delivered before the New York Electrical Society Nov. 20.

Adhering still to the three-color theory in which red, yellow and green are taken as the primary colors, the average architect will define English vermilion, gamboge and Prussian blue to be the elementary tints. But, as pointed out by Mr. Jones, in dealing with the colors of pigments we are really dealing with colored light. Thus, yellow pigment may be assumed to absorb all of the blue light that falls upon it, reflecting only yellow light as well as red and green, the mixture of which produces the sensation of yellow. There is not enough yellow light in normal white light to account alone for the luminosity or brilliancy of certain yellow pigments.

Similarly blue pigment absorbs all of the red, yellow and green light falling upon it and reflects only blue light. When these two pigments are mixed together there results a broken green pigment, broken because in effect it is mixed with a large quantity of black; that is, its luminosity is greatly reduced. This effect is due to the fact that the yellow pigment in the mixture absorbs blue, while the blue pigment absorbs yellow, red and green, so that almost all of the light falling upon the mixture is absorbed and a small quantity of green reflected. Hence every step in the mixture of pigments is a step toward black, and contrariwise every step in the mixture of colored light is a step toward white. The theory of color in pigments can be explained only on the basis of the theory of color in light, which names as the three primary light colors red, green and blue, corresponding to certain definite wave-lengths in the spectrum.

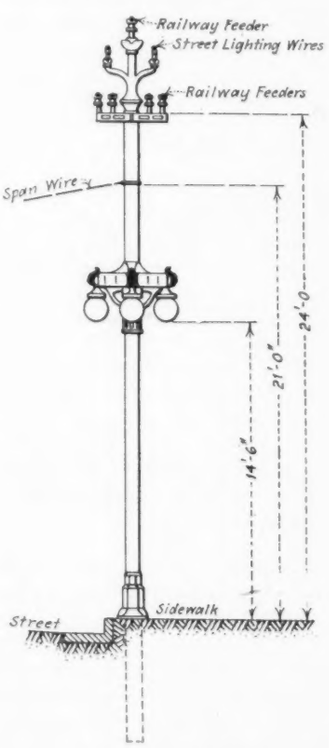
Color in light can be produced in three ways—by absorption of certain selected wave-lengths; by the additive combination of certain wave-lengths, and by the simultaneous reflection of separate selected wave-lengths. Usually any method of producing color combines all three methods. In absorption all of the wave-lengths except those required to produce the proper color are absorbed by the medium. If a medium reflects light of a certain color when white light is thrown upon it and transmits the light which it does not reflect, the color of the transmitted light must be the complementary color of the reflected light, since the two combined must produce white light.

If transparent pigments are used—and all pigments are more or less transparent—and such pigments are applied to different colored background or character of materials, a certain portion of the light falling upon the pigment is reflected. The rest is transmitted through the pigment and partially reflected from the surface upon which the pigment is applied. Here its color is again modified by absorption, and still again partially modified by retransmission through the pigment to its surface, where it is mixed with the light reflected from the surface of the pigment. Consequently, the production of color by pigments or dyes applied to materials is by no means simple, but depends not only upon pigment used but also upon the thickness of the pigment layer, the medium with which it is mixed, the color of the surface and the character of the surface on which it is applied. All of these aspects of the problem must be carefully studied if any accuracy in color balance is to be produced when the colored surface is provided with light from artificial illuminants, the light emitted from which must of necessity differ from the color of daylight.

With the proper study in the selection of color screens, artificial illuminants, dyes and materials, some exceedingly interesting color combinations and color changes can be produced. This study, practically limitless, opens up a broad field for effects in interior decoration. By varying the color of the illumination in suitable ways decorative design in color may be made to change.

First Use of Incandescent Lamps on Denver's Business Streets

For a distance of thirteen blocks on Eighteenth Street, Denver, construction is under way to install 102 ornamental tubular-steel poles which will support the trolley-span wires, street-railway feeders and incandescent street lamps. This is the first time that incandescent lamps have been adopted for street lighting in the business districts of Denver, arc lamps being employed to light Fifteenth, Sixteenth and Seventeenth Streets. Different types of ornamental poles are used on each of these streets.



ELEVATION OF POLE

The poles and pressed-steel cross-arms for supporting the railway feeders in the case of the new Eighteenth Street installation will be furnished by the Denver Tramway Company, while the lamp brackets, elk horns and bases will be paid for by the abutting property owners. The new poles carry five 500,000-circ. mil railway cables, which is in marked contrast to the old installations equipped with fourteen-position cross-arms supporting as many feeders of various sizes. The circuits for the ornamental lamps will also be strung on the elk horns.

Letter to the Editors

Rates for Electric Service

To the Editors of the Electrical World:

SIRS:—The writer begs leave to reply to some of the statements made by Mr. Percival Robert Moses in your issue of Oct. 25, in which he criticises existing methods of charging for electrical energy as unfair and advocates a uniform flat price per kilowatt-hour for all classes of business.

While the production and distribution of electricity is a business peculiar to itself, the sale of the product is governed by the same general rules of merchandising as apply to the sale of other commodities, with the added complication that the electric company's business is of public concern and the public has a right to share in its prosperity. That there should be no unjust discrimination is conceded, but we must not mistake the proper adjusting of charges between classes for discrimination. The only adjustment of charges which is harmful is that which results in an injustice. Differentiating between classes and conditions does not injure anyone, but distinctly benefits everybody.

A uniform price per kilowatt-hour would of necessity be an average price—a compromise. It would be, therefore, too high for the big or long-hour business and too low for the small or short-hour business. We could not *get* the first business at this average rate, nor could we afford to *take* the second at that rate.

When central stations had only the short-hour lighting business the prevailing rate was 20 cents per kilowatt-hour. Since obtaining the motor-service business they have been able to reduce the rate on lighting to one-half the former charge. The motor-service customers know that the central stations are saving money for them, or the latter would not get the business, and the lighting customers have the benefit of a 50 per cent reduction in rate. Is anyone injured by this so-called discrimination? How can it be stated that the small consumer is paying an excessive rate, by reason of which the central stations are able to secure the motor-service business at too low a rate, when the facts show just the reverse condition of affairs?

There is a price at which each class of business can be obtained. If a price above that value is quoted no business results. If that price is sufficiently above the increment cost resulting from this additional business to produce a reasonable profit, one is justified, from every standpoint, in taking the business, even though the price quoted is below the average cost, for the profit so obtained will result to the benefit of all.

It is apparent that a given community demands apparatus necessary to meet its maximum requirements, with a reasonable reserve. This apparatus, in an undeveloped business, is used for only a few hours per day, resulting in a comparatively high average cost per kilowatt-hour. It seems obvious that business which would use the apparatus at hours when it would otherwise be idle will result in comparatively little additional operating expense. Mr. Moses states that central stations should sell their product on a cost basis, but were they obliged to sell energy at the cost of producing the additional energy over and above the previous costs, plus a fixed profit, then they would be quoting a rate ridiculously low, resulting in an unnecessary large saving to that class of customers. On the other hand, if the charge were based on the average cost, plus a profit, the business could not be obtained, and hence the proper price is somewhere between these extremes. The proper price is just a little below what it would cost the consumer to reproduce the same service, thus resulting in a saving to him and a larger profit to the company. In this manner each class contributes its full share to the profits of the company, but it can be done only by differential rates, the profits from which can be shared with the public, by reducing the rates to the small consumer at first and ultimately to all classes.

No business, except during the development period, should be taken at less than the increment cost to serve it, plus a reasonable profit, but each class of business should be taken at the highest price it can afford to pay. Then when all the business is obtained by the supply company each class will be served at a price which will be much lower than it could serve itself. This may or may not be unjust discrimination, but it is practised by practically every other class of business, and by Uncle Sam, too.

The public is interested only to the extent that each class gets proper value—the large consumer at less than he can produce the service and the small consumer at a price at which he can afford to use it. The extra profits over a fair return on the investment will be applied to reduce the price to the consumers.

It has been stated that central stations enjoy a monopoly, but such is not the case. While it is true they justly have a monopoly of the use of the streets, there is no monopoly of the business. They are in competition with private plants, gas, oil, etc., but, keenest of all, are selling a commodity that people need not use and for which they will not pay more than the service is worth to them. The public have a right, as consumers, to see that the rates reach that level which they would find were competition unrestricted but fair, and as partners in the business they are interested that no class be served at a lower level.

The illustration used by Mr. Moses in his legal quotation, where "A" gets 200 kw-hr. at 10 cents and "B" gets 20,000 kw-hr. at 2 cents, and the cost of producing each kilowatt-hour sold to both was 4 cents, is obviously unfair. If the conditions were identical, as he assumes, no sane central-station man would attempt to make such a distinction solely for quantity. Suppose, however, the conditions were not identical, and it could be shown that at 10 cents "A" might cause a loss and at 2 cents "B" might produce a profit, even though the average cost of serving both (with other business) might be 4 cents. In that case which customer is being served at too low a rate? The cost of serving any particular class is seldom equal to the average cost of serving all classes, so that any conclusion based on such an assumption is necessarily in error; but if the cost of service was actually used as the sole basis of charge, the present high-cost business would inevitably become higher.

Much of Mr. Moses' criticism on the great difference in the methods of charging between companies is justified, but it is so because of the present period of evolution. Much has been done to unify rates and much more will be done. It is surprising, however, to find how closely the different rate schemes of the principal companies result in the same net rate, though wide apart in detail. The demand rate has been popular, and justly so, for, as it happens, it arrives fairly close to the value of the service to the various classes and closely approaches the larger customers' costs when serving themselves, thereby fixing the value of the service rather than the cost of the service.

The diversity factor is what makes the business possible at existing low rates. Were it not for this factor the investment would be very much larger, the load factor lower, and consequently the cost very much higher.

Mr. Moses need not speculate on what would become of the business were central stations deprived of the low-priced motor-service business, for history holds abundant proof of that. The stations would inevitably be forced to charge much higher prices for the remaining business, and the communities would be deprived of a service which now promises to be well within the reach of all at lower prices than exist to-day. Classification must be allowed to accomplish this—that is, a fair and proper difference in rates between classes, but not discrimination between individuals in the same class.

Scranton, Pa. L. H. CONKLIN.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Electric Pumps for University Fire Protection

To provide additional water pressure in case of fire on its campus the University of Michigan has installed two motor-driven Rees Roturbo fire pumps which discharge into a network of mains supplying fire hydrants. Both pumps are in the Engineering Building, and their intake pipes connect with the 500,000-gal. marine experiment tank, which is kept filled from the city water mains. As this tank is about 300 ft. long, 22 ft. wide and 10 ft. deep, the water supply for extinguishing fires is practically independent of that delivered by the city mains.

Each pump is designed to deliver 1250 gal. of water per minute against a 306-ft. head and is driven by a 150-hp Fairbanks-Morse wound-rotor induction motor. The pumps are ordinarily operated in parallel but may be connected in series to obtain added pressure. The motors driving them operate on 440-volt, three-phase energy and are rated at 1200 r.p.m. full speed. Facilities have been provided for duplicate electric service, throw-over connection being made with both the Eastern Michigan Edison Company and the University power plant.

Starting apparatus, switching equipment and transformers for these two fire pumps are neatly arranged along one side of the mechanical laboratory.

The switchboard consists of four black slate panels, on two of which is mounted the high-tension switching apparatus for the transformers. The low-tension oil switches in the motor circuits are installed on the other two panels. Meters and other facilities for conducting tests on the

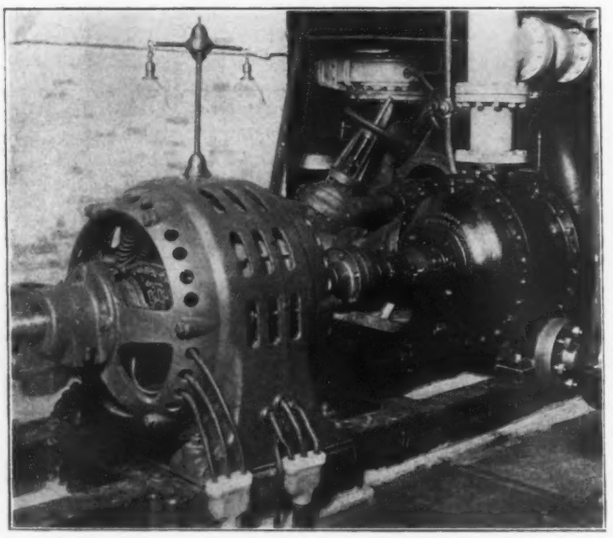


FIG. 1—150-HP MOTOR DRIVING FIRE PUMP AT UNIVERSITY OF MICHIGAN

operation of the motor-driven pumps are also provided. The low-tension buses are wrapped in black insulating material to distinguish them from the high-tension buses, which are insulated with oiled linen.

Two 150-kva, 2200-440-volt, three-phase transformers are installed at one end of the switchboard—one being used with each motor to provide flexible operation. Two speed controllers and a stack of resistance grids are installed at the opposite end of the switchboard. The grids are built up in a single vertical stack about 7 ft. long and 8 ft. high

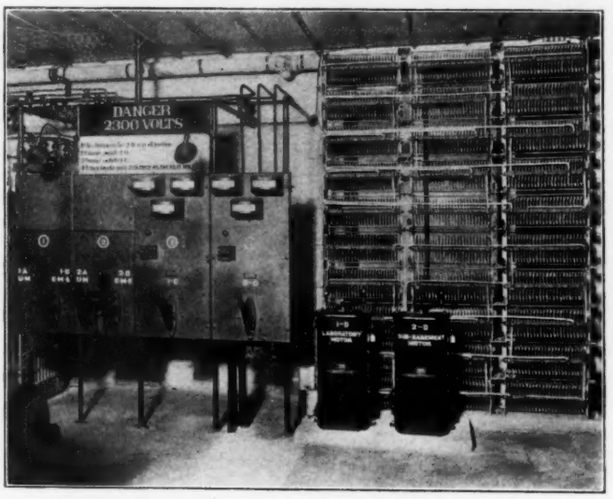


FIG. 2—CONTROL APPARATUS FOR UNIVERSITY ELECTRIC FIRE PUMPS

to economize space. The entire equipment has been erected in a very limited area, but every effort was made to arrange the parts accessibly.

Voltage Variation in Compound-Wound Generator

A compound-wound generator that would give an absolutely flat voltage characteristic from no load to full load would cost too much per horse-power. The compounding curve of a commercial generator has a hump in it, and it is customary so to adjust the compounding that normal voltage exists at no load and full load, while at all intermediate load values the voltage exceeds normal value. In a case in mind the operator had two compound-wound generators operating in parallel. When the total load was about 375 amp the larger machine supplied about 250 amp and the smaller machine about 125 amp; when the smaller machine was cut out by pulling its switch the load current increased to about 385 amp. The operator was very much concerned as to the 10 amp increase that apparently came from nowhere.

The explanation of what to him was a mysterious phenomenon is as follows: The increased current thrown upon the larger machine by removing the smaller machine from the circuit moved the larger machine's load up to a value corresponding to the hump of its compounding curve, thereby raising its voltage a little. A glance at the voltmeter would have shown an increase in the voltage. Of course, all of the lamps were burning a little more brightly and each was taking a little more current. The operator was justified, in a way, in expecting that the current would be the same whether the current was produced by one machine or two, but a look at the voltmeter before and after removing the smaller machine would have suggested the true cause of the variation.

GRIPPER AND SIDE GUIDE

Utilizing a Difficult Corner on a Switchboard Gallery

The accompanying photograph shows a chief operator's desk in a narrow corner on a switchboard gallery in a New England power station, the feature being the use of space over a stairway which appeared to be the only available site for the desk. The front of the gallery was narrow

REMOTE CORNER OF SWITCHBOARD ROOM UTILIZED FOR DESK SPACE

and had room only for a table upon which station logs are written. At one end of the switchboard and two stories above the floor of the turbine room a stairway connects the operating gallery with the rest of the station. The problem of desk location was solved by the use of angle irons supporting the desk at the stairway railing and against the wall at the left, a special U-shaped bar being placed under the right-hand tier of drawers to support this portion of the desk. The railing at the right side of the photograph protects operators on the gallery from falling down the stairs, and the compactness of the whole arrangement is even more apparent to the visitor than can be shown by a photograph.

Heating Not Due to Motor Trouble

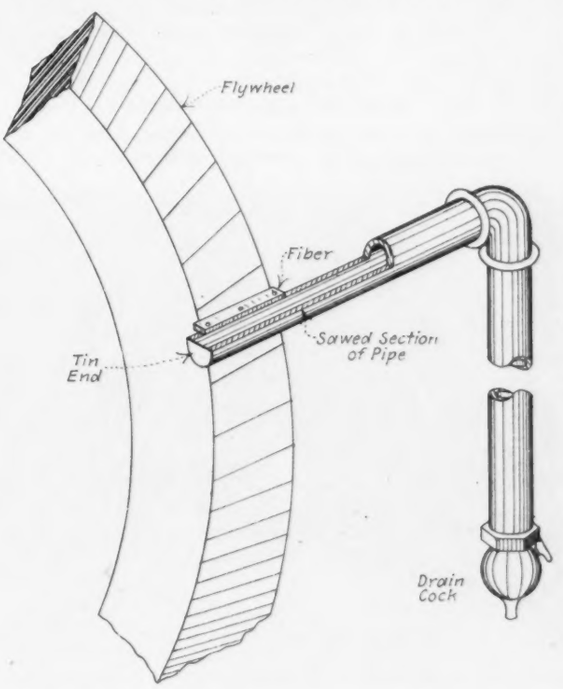
An inspector in the South was called in hurriedly to locate the trouble in a three-phase slip-ring induction motor just installed to operate the compressor of a refrigerating plant. Careful inspection of motor, wiring and compensator failed to reveal any irregularity, so the motor was put under load and thermometers were applied. While the motor was operating the inspector noticed that one of the bearing-cap bolts of the compressor crank shaft was lying upon the pedestal and further inspection showed that all of the cap bolts had been slackened. On making inquiry of the proprietor, it was learned that the compressor had developed a hot box due to a bent shaft. The cause of the motor heating excessively was now evident, but, as a matter of record, two ammeters were cut into two of the motor legs and the meter readings noted while the cap bolts were slowly tightened. With the cap bolts loose, the motor took a balanced current of 30 amp with the compressor by-passed. This was 4 amp more than the motor's full-load current rating. As the cap bolts were very slowly tightened, the current increased rapidly, finally exceeding the range of the ammeters before the cap bolts could be screwed home. The effect of the bent shaft binding in the bearings under the original conditions could hardly be estimated, but the motor was fused for four times full-load current and the fuses blew as fast as they could be replaced. The lesson of this experience is that the seat of trouble is quite as likely to be found in the connected load as in the motor itself.

To Prevent Flywheels Throwing Oil

Sometimes an otherwise well-kept engine room presents the incongruous spectacle of an ugly line of oil stains opposite the engine flywheel. Such stains are hard to remove after they have been once deposited, but by a little care the wheel can be prevented from throwing the oil in the first place. The lubricant, of course, escapes from the bearings, and with the assistance of centrifugal force creeps out to the rim of the wheel. Here it must first collect in drops or globules before the forces of adhesion and cohesion "let go" and the drop flies off through the air to add its mite to the growing discoloration.

Almost any kind of a scraper or wiper that will remove the oil from the wheel's rim will prevent the wall stains, but an improved device for the purpose can be made out of an oblong tin can having its sides cut away to fit the curve of the wheel. The can is filled with waste which presses against the rim, wiping off the oil in a thoroughly neat and effective manner.

Another effective wiper is made of a piece of ½-in. pipe with one-half sawn away as the sketch shows, and the end



DEVICE FOR REMOVING OIL FROM FLYWHEEL RIM

closed with a piece of tin forming a trough. Fixed to the pipe by means of screws is a lip of hard fiber which projects ½ in. over the side and bears against the wheel face. Oil collected by this lip is drained through the trough into the vertical pipe which can be emptied at intervals. The flexibility of the vertical pipe serves as a spring to hold the lip in contact with the wheel.

GRIDDER AND SIDE GUIDE

Quick-Firing Arrangement of Boilers to Relay Water-Power

As already noted in these columns, hydroelectric energy transmitted from the Mississippi River water-power plant at Keokuk, Ia., is purchased by the Union Electric Light & Power Company, of St. Louis, Mo., as an auxiliary to the supply furnished by the company's own large steam plant

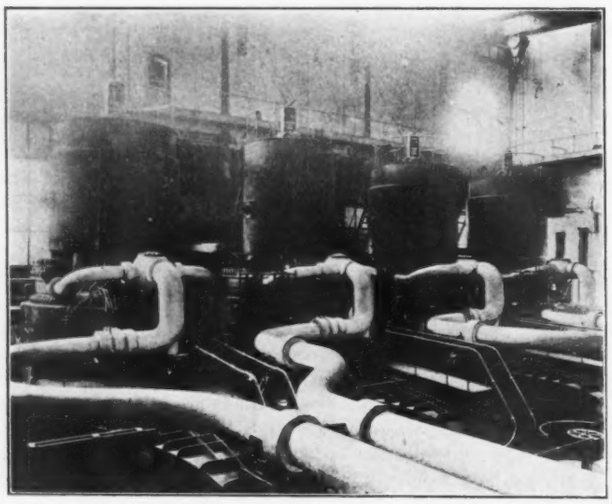


FIG. 1—12,000-KW TURBINES IN ASHLEY STREET PLANT, ST. LOUIS

at Ashley Street. To guard against interruptions in case of the possible failure of the hydroelectric system, the Ashley Street station is now being operated in such a manner as to be able to take up the entire load, both water-power and steam, in a few minutes' time.

Such emergency operation requires, of course, that extra boilers be held in readiness for use at very short notice. The present steaming equipment comprises fifty-two boilers. Of this number thirty-two are operated under continuous fire for carrying the regular steam load of the system. All of these boilers are used at the peak of the load,

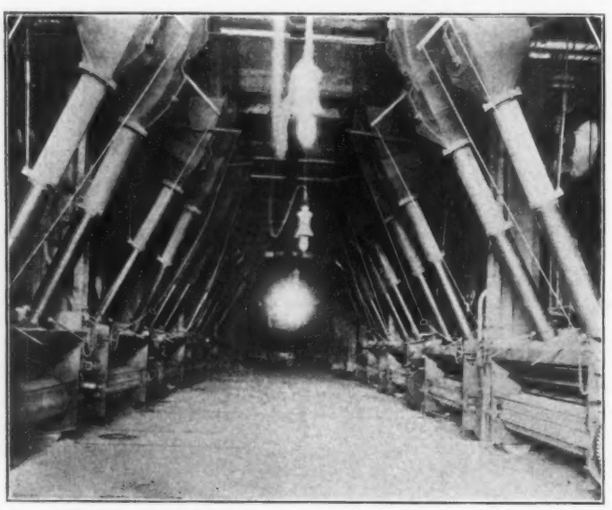


FIG. 2—INTERIOR OF BOILER ROOM, ASHLEY STREET STATION

and as each boiler is rated at an output of 1000 kw, it is possible to carry loads of 32,000 kw, which is nearly the system peak at the present time. As the load falls off after the peak has been passed, these boilers are banked one after another. For a few hours during the night only six are held on the load.

For emergency operation in case of transmission-line troubles the twenty extra boilers are at all times kept in readiness by circulating through them water at a temperature of 210 deg. Fahr., while on their grates fires are built and made ready to light at a moment's notice. The boilers at Ashley Street are located on two decks, the units of the lower deck being used for emergency service. An accompanying sketch shows how these emergency fires are laid.

The grate is first covered with a high-grade nut coal to a depth of 7 in. and three rows of oily rags are then placed in cross trenches. Another row of rags extends down the middle to carry along the flame to all parts of the grate. On top of these rows of rags is laid kindling-wood soaked in kerosene, while a few gallons of fuel oil are sprinkled across the top of the entire bed of coal. This arrangement, as may be readily appreciated, gives a hot fire very quickly. The best time made thus far in getting a boiler on the header, starting from zero pressure, is sixteen minutes. The water in the boiler at starting the fire was at 212 deg. Fahr.

But surprising is the fact that by this quick-firing method it is possible to get a boiler in on the header in about half the time it takes when the boiler has a banked fire. To

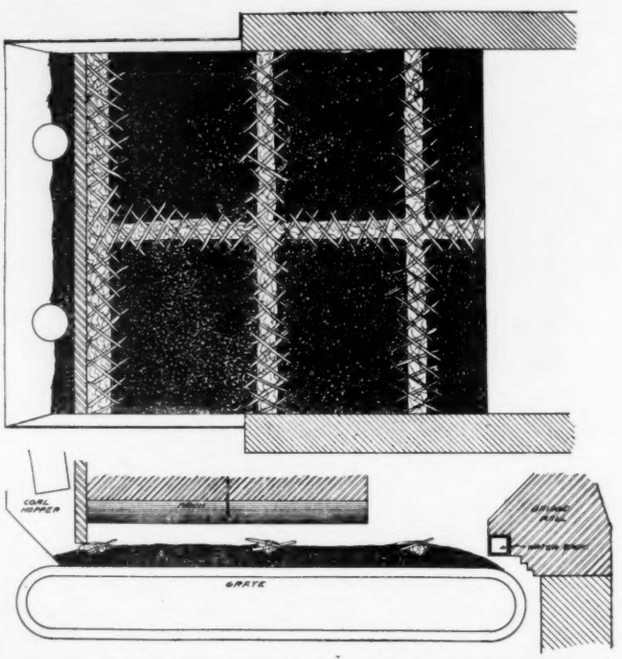


FIG. 3—METHOD OF LAYING FIRE FOR QUICK IGNITION

bank a boiler with coal and to keep the water at 212 deg. requires about 130 lb. of coal per hour per boiler. As this bank is a "short fire" on the front of the grate only, and as the grate must move very slowly to ignite the coal, a long time will be taken to get a full grate of coal and a full fire. The fastest record made in bringing such a banked boiler in on the header at Ashley Street was thirty-two minutes, or twice the time of getting up steam over the quick-firing grates.

Two blasts on a large steam whistle in the boiler house are given to inform all employees in and around the station that the water-power has failed and that the steam plant is to pick up and carry the full load. Immediately each man in the plant goes to his "emergency duty," which has been previously assigned to him through the emergency lists posted in conspicuous places about the station. Certain men report to the boiler-house engineer for igniting fires, bringing up banked boilers, barring slow fires, or any other duty that may be assigned them. Others report to the engineer in charge of the engine room for service as oilers and operators on engine and turbine units. The emergency organization is so arranged that every man shall immediately be placed to best advantage for carrying additional steam load on the station.

The method of keeping water hot in the emergency boilers, which is somewhat unique in a large power plant, is shown in Fig. 5. No additional piping or equipment was used aside from a heating coil installed in one of the two blow-off tanks in the basement. The common blow-off header connecting the twelve boilers was connected to the lower part of this tank. This header serves to bring the cool water from the lowest part of each boiler. In the tank is installed a coil through which the waste steam from one of the large steam headers is caused to flow, thus also serving to drain the header. This steam heats the water in the tanks, sets up circulation, and delivers hot water to the common pipe-line connecting with the upper part of each of the boilers. The principle is the same as that in which the heat from coal burned in a hot-water furnace in a household circulates the water and maintains the desired temperature. Hot water is thus being continually drawn away from the bottom. The water in these boilers is in this way kept at practically the boiling point, while the fuel expenditure is only 12.5 lb. of coal per boiler per day, as against 3100 lb. per boiler per day with banked fires.

Another interesting aspect of the importation of Keokuk energy into St. Louis has been the effect of water-power operation on the cost of the Union company's coal supply and on the St. Louis market generally. A year ago the Ashley Street plant burned something over 1100 tons of coal per day. This fall the consumption amounts to only 650 tons per day. The result of this falling off in coal consumption by the Union Electric company, coupled with a similar reduction by the United Railways Company of St. Louis, has been to throw a large amount of screenings on the local market, thus very effectively lowering the price of all screenings shipped from the mines in the vicinity. The prices of the larger sizes of coal for domestic use are not affected by this condition, but there is a marked decrease in the cost of screenings for power-station use from that of a year ago.

Fig. 4 gives an idea of the proportion which boiler-room

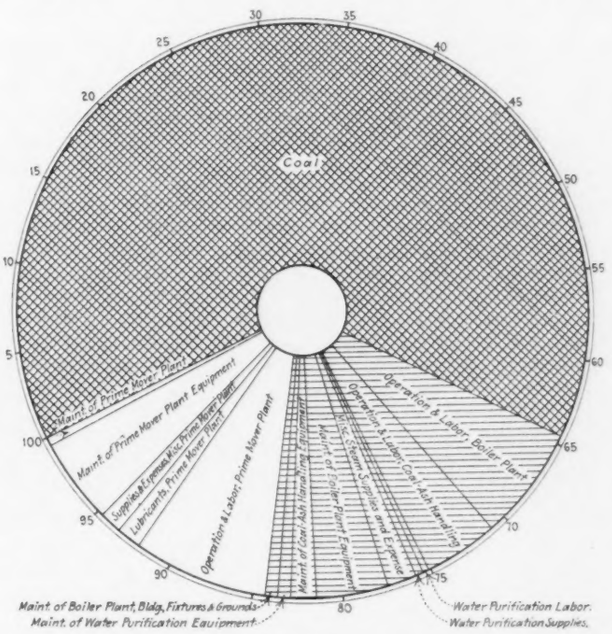

Coal
Amount of Prime Mover Plant
Maint. of Prime Mover Plant Equipment
Supplies & Expenses, Misc. Prime Mover Plant
Lubricants, Prime Mover Plant
Operation & Labor, Prime Mover Plant
Maint. of Coal & Ash Handling Equipment
Maint. of Boiler Plant Equipment
Operation & Labor, Coal & Ash Handling
Misc. Steam Supplies and Expenses
Operation & Labor, Boiler Plant
Maint. of Boiler Plant, Bldg., Fixtures & Grounds
Maint. of Water Purification Equipment
Water Purification Labor.
Water Purification Supplies.

FIG. 4—DIAGRAM SHOWING ANALYSIS OF POWER-PLANT COSTS

costs in a power plant bear to the total cost of generation. The cost of fuel is here seen to be 64.5 per cent. Boiler-plant maintenance and operation bring the total up to 84.5 per cent, leaving but 15.5 per cent for the cost of prime-mover plant operation and maintenance. From this it will be obvious wherein lie the main items of cost in steam-plant operation and where the greatest attention must be given in connection with economical operation. The diagram also serves to point out the advantages achieved by water-power supply in tending to preserve one great natural resource, namely, the large quantities of coal required for electric generation throughout the country.

Perhaps the place at which the effect of importing water-power is most noticeable is in the engine room at Ashley

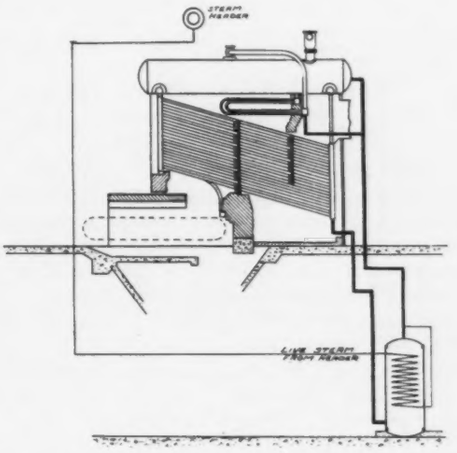


FIG. 5—ARRANGEMENT FOR HEATING EMERGENCY BOILER

Street, where it is now possible to shut down the engine units, and to carry all of the regular load of the system on the turbines there installed.

"We have been very fortunate so far in that we have had little trouble with failure of water-power," writes Mr. John Hunter, engineer of steam plant for the Union Electric Light & Power Company, "but we maintain that it is a good plan to be prepared and to hold ourselves in readiness for continuity of service, which is second to none in the country."

Resistance of Iron Pipes

Are there any tables giving the resistance of various standard iron pipes such as are used in water, gas and sewer systems? T. G.

The resistance of iron pipe is usually expressed in ohms per pound-foot of the various pipe materials. For all practical purposes the values for cast-iron, wrought-iron and steel pipes are as follows: cast iron, 0.00144; wrought iron, 0.000181; steel, 0.00021 ohms per lb.-ft.

Wattless Currents

What are wattless currents and how are they caused? A. W.

When the current in a circuit has a power-factor less than unity due to the presence of inductance or capacity in the circuit, it is sometimes convenient to consider the main current as being made up of two components, one of which is in phase with the emf while the other lags or leads by a phase angle of 90 deg. The current component in phase represents, of course, the power actually being delivered to the circuit which is measurable in watts. The other component, which is out of phase, represents no permanent transfer of energy and is therefore called "wattless." This wattless current circulates in the windings and does no work except to heat the conductors as any current would do. If the wattless component of the main current becomes large, as in the case of low power-factors, its heating effect may involve large I^2R losses. Poorly designed induction motors carrying partial loads operate at low power-factors with relatively large wattless currents, the wattless components of the currents being practically as large at light load as at full load.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Predetermining the Effect of Field Distortion in Direct-Current Generators.—Alfred Hay.—An illustrated article in which the nature of the distortion produced in a continuous-current generator by the cross-magnetizing ampere-turns on the armature is briefly discussed. A simple method is explained for determining the addition to the field ampere-turns necessitated by the effects of field distortion.—London *Electrician*, Nov. 21, 1913.

Alternating-Current Commutator Motor.—A note on a recent British patent (No. 20,849, 1912) of the British Thomson-Houston Company and the Allgemeine Elektricitäts Gesellschaft. The stator exciting and working windings and the rotor working winding are in series, but the first is also connected in parallel with a choking-coil compensator. A point in the winding of this coil is connected to a point in the winding of the supply transformer, so that the impedances of the rotor and stator circuits are equalized.—London *Elec. Eng'ing*, Nov. 13, 1913.

Lamps and Lighting

Color of Light from Electric-Lamp Sources.—L. Bloch.—A paper read before the German Illuminating Society. In order to characterize completely the color of artificial sources of light, a spectrophotometer may be used and the light of each wave-length determined separately, but this method is very complicated. Ives has already shown that any color is defined by the manner in which it is made up of the three fundamental colors—red, green and blue. The present author uses the same principles, employing for the purpose glass of well-defined colors (red filter, green filter and blue filter, made by Schott & Company). These three colored glasses are inserted as round plates, 7 mm in diameter and 1 mm in thickness, in a revolvable disk in the photometer as shown in Fig. 1, where 1 represents the red plate, 2 the green plate and 3 the blue plate. The fourth hole is left open for making measurements in white light. Readings may be taken with any photometer. From the results of the measurement two numerical values are formed, namely, the ratio of red to green and the ratio of blue to green, corresponding to daylight with covered sky, for which both values are assumed to be 100. If the value of red to green is, therefore, 99.5 per cent and that of blue to green is 29.5 per cent (which are the characteristic values for intensive flame-arc lamps with carbons giving yellow light), it means that the light of the lamp in its richness of red light agrees almost exactly with daylight while there is a considerable lack of blue rays in the light. The author has determined these two characteristic values for all kinds of lamps and gives the results in tables and diagrams. In the diagrams the ordinates show the value of red to green and the abscissas the values of blue to green. Every lamp has, therefore, a distinct position in the diagram so that from its position on the chart there can be seen at a glance how nearly any source of light approaches daylight. Some of the values arrived at are given in the accompanying tabulation. The magnetite-arc lamp seems to approach nearest to sunlight. All these experiments were made at the testing station of the Berlin Electricity Works.—*Elek. Zeit.*, Nov. 1, 1913.

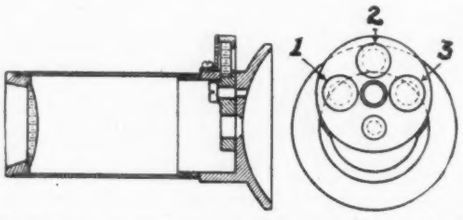


FIG. 1—SPECTROPHOTOMETER WITH THREE COLORED-GLASS FILTERS

COMPARATIVE COLOR VALUES OF VARIOUS LIGHT SOURCES

	Ratio of Red to Green	Ratio of Blue to Green
Daylight, covered sky	100	100
Daylight, blue sky	80.5	116
Sunlight	116	92
Paraffine candle	463	34
Kerosene lamp	403	36.5
Illuminating gas with ordinary burner	313	46
Low-pressure incandescent gas lamp	190	50.5
Carbon lamp (4 watts per hefner-cp)	342	43
Carbon lamp (3.5 watts per cp)	330	44
Carbon lamp (3 watts per cp)	317	45.5
Graphitized carbon lamp (2.5 watts per cp)	305	47
Graphitized carbon lamp (2 watts per cp)	290	49
Nernst lamp without globe (1.7 watts per cp)	275	48
Tantalum lamp (1.7 watts per cp)	300	47
Tungsten lamp (1.2 watts per cp)	271	50.5
Tungsten lamp (1 watt per cp)	256	53
Tungsten lamp (0.8 watt per cp)	245	55.5
Nitrogen-filled tungsten lamp (0.6 watt per cp)	211	59
Nitrogen-filled tungsten lamp (0.5 watt per cp)	200	61.5
Nitrogen-filled tungsten lamp (0.4 watt per cp)	190	63.5
Pure carbon arc lamp without globe	160	71.5
Magnetite-arc lamp	114.5	85.5
Intensive flame-arc lamp, white light	125.5	63.5
Intensive flame-arc lamp, yellow light	99.5	29.5
Intensive flame-arc lamp, red light	592	74
Mercury-arc lamp with glass tube	9	32.5
Mercury-arc lamp with quartz tube, without globe	20	30
Mercury-arc lamp with quartz tube and opal globe	20	25
Moore lamp filled with carbonic oxide	85	108
Moore lamp filled with nitrogen	655	15
Moore lamp filled with neon	2,240	6

Photometry of Lamps of Different Colors.—M. von Pirani.—An account of experiments made in the physical laboratory of Siemens & Halske, the object of which was to find a correct method of monochromatic comparison of lights of different colors. The principle employed involves the use of a filter which eliminates color effects but permits light to pass so that the ratio of the two intensities is the same as that of the total intensities. For ordinary incandescent lamps this is fulfilled by the use of a filter which permits the wave-lengths 570 to 575 $\mu\mu$ to pass. The mean values of the measurements differ from those obtained without the filter by only 1 per cent. It is therefore permissible to compare by this means standard lamps worked at low intensities and producing yellow light with those operated at high rates of output and giving bluish-white light.—*Zeit. f. Beleucht.*, Aug. 30, 1913.

Vapor Pressure of Metallic Tungsten.—Irving Langmuir.—An account of an experimental investigation, the chief results of which are as follows: The vapor pressure p of a substance is related to its rate of evaporation m in a vacuum, as follows:

$$m = p\sqrt{\frac{M}{2\pi RT}}$$

where M is the molecular weight of the vapor. In the derivation of this equation it is assumed that all the molecules of vapor which strike the surface of the metal are condensed (not reflected). No other assumptions except those that have received ample experimental verification need be made. Experiments were carried out to determine the rate of evaporation of tungsten in a vacuum at temperatures ranging from 2440 deg. up to 3136 deg. K. (deg. C. above absolute zero). Over this temperature interval of 700 deg. the rate of evaporation increased in the ratio of 1 to 15,000. From the above data the vapor pressures were calculated and were found to agree excellently with the thermodynamical relations as expressed in the Clausius-Clapeyron formula. The latent heat of evaporation of solid tungsten is thus found to be (per 184 grams) $(217{,}800 - 1.8\,T)$ calories, a value higher than the heat evolved by any known chemical reaction. The rate of evaporation of tungsten in a perfect vacuum at any temperature is given accurately by the equation

$$\log_{10} m = 15{,}402 - \frac{47{,}440}{T} - 1.4 \log_{10} T.$$

Here m is the rate of evaporation in grams per square centimeter per second. The vapor pressure p of tungsten in millimeters of mercury at the absolute temperature T is given by the equation

$$\log_{10} P = 15{,}502 - \frac{47{,}440}{T} - 0.9 \log_{10} T.$$

The vapor pressure of tungsten at 2400 deg. K., which is the temperature of the filament in a lamp running at 1 watt per candle, is about 50×10^{-9} mm. At the melting point of tungsten, 3540 deg. K., the vapor pressure is 0.080 mm. The boiling point of tungsten at atmospheric pressure is probably very close to 5100 deg. K.—*Physical Review*, November, 1913.

High-Candle-Power Lamps.—J. SCHMIDT.—A long article on the high-candle-power metallic-filament lamp versus the flame-arc lamp and the double-carbon flame-arc lamp. The author emphasizes that high-candle-power metallic-filament lamps cannot completely replace flame-arc lamps and describes in some detail recent improvements in flame-arc lamps.—*Zeit. f. Beleucht.*, Aug. 30, Sept. 10, 20, Oct. 20 and 30, 1913.

The "Half-Watt" Lamp.—R. ZIEGENBERG.—A fully illustrated article on the "half-watt" incandescent lamp, its development and its present construction.—*Zeit. f. Beleucht.*, Oct. 30 and Nov. 10, 1913.

Generation, Transmission and Distribution

Water-Power Plant.—E. FREY AND O. ALBRECHT.—The conclusion of their long illustrated description of the Wylen power plant of the Rheinfelden transmission system. The gradual development of this system is described. The first two large customers were two electrochemical firms, the Aluminium Company, of Neuhausen, and the Electrochemical Works, of Bitterfeld. Later on electricity was introduced for various industrial purposes and transmitted to the surrounding districts. For these purposes subsidiary companies were formed. Finally, in connection with the city of Basel, the new Wylen hydroelectric plant was erected. It was possible to connect up at once a large number of new customers so that the dividends were maintained at 8 per cent, as in recent years, in spite of the increased capital investment.—*Elek. Zeit.*, Nov. 13, 1913.

Steam Boilers.—J. W. JACKSON.—A paper on steam boilers in electric generating stations. The author deals especially with the best position for superheaters and main steam drums, the importance of air leaks, the use of mechanical stokers, and feed-water treatment. One of the most notable advances is said to be smokeless operation with ordinary bituminous or low-grade coal.—London *Electrician*, Nov. 13, 1913.

Coal Mines.—W. H. TELFER.—An abstract of a paper read before the Scottish branches of the National Association of Colliery Managers and the Association of Electrical Engineers of Glasgow on power transmission in collieries.—London *Electrician*, Nov. 14, 1913.

Traction

Single-Phase Mountain Railway.—A continuation of the illustrated description of the Spiez-Brig (Loetschberg tunnel) Railroad. In the present instalment the electric equipment is described. The two motors of each locomotive are rated at 1250 hp each and are of the compensated series type.—*Elek. Zeit.*, Nov. 13, 1913.

Installations, Systems and Appliances

Two-Rate Schedule Without Time-Operated Control.—H. H. PERRY.—A paper read before the Manchester Section of the (British) Institution of Electrical Engineers. The author considers it ridiculous to charge at certain

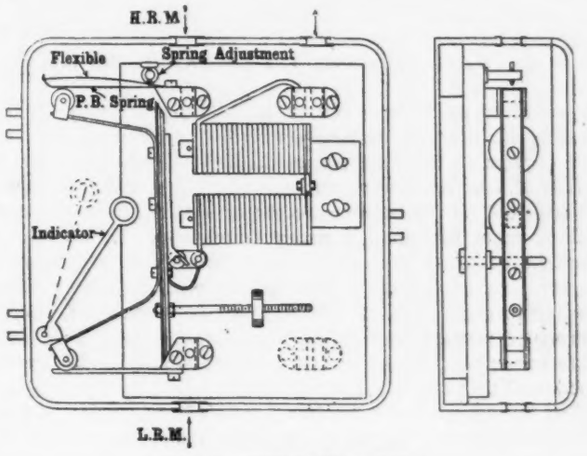


FIG. 2—TWO-RATE SWITCH

times of the day a low rate for motor service and another rate for lighting, and declares it equally absurd to exact the full penalty price from a consumer when he is using only a fraction of his maximum lighting load, assuming that no heating is in use. Mr. Perry endeavors to show that the use of electricity can be extended with advantage to both central station and consumer, by granting facilities to the latter for using lighting circuits during "off-peak" hours at a low rate, and that the multiplication of domestic power circuits, while being an advantage, is not always necessary for securing a low rate. A simple change-over switch, automatically rocked, can combine or separate the two rates at will. Such a method requires two meters and

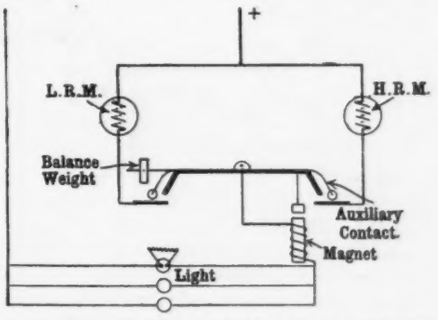


FIG. 3—CONNECTIONS FOR LAMP LOAD EXCLUSIVELY

therefore resolves itself into a two-rate system. From former systems using two meters, the present system differs in that the operation of switching over is automatically performed by a magnetic change-over switch. As shown in Fig. 2, an ordinary single-pole switch is employed, one arm of which is magnetically attracted by the lighting-circuit magnetizing current. It is freely pivoted about its

center, and a balance weight is provided on the other arm, the position of which is adjusted to give any proportion of the consumer's lighting between, say, 5 per cent and 25 per cent, at the low rate. In isolated cases it may be practicable to give a higher percentage. Auxiliary contacts are provided for maintaining continuity of the circuit when changing over. The connections shown in Fig.

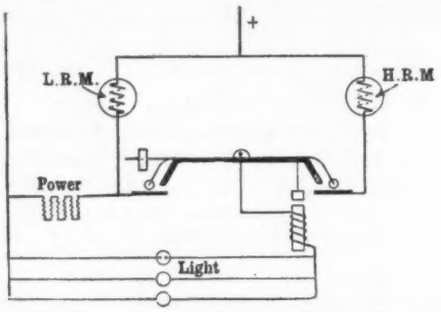


FIG. 4—SWITCH CONNECTED FOR SEPARATE POWER CIRCUIT

3 would be used for a consumer taking practically all his energy for lighting, no separate circuit being provided. All the current in this case passes through the high-rate meter (*H.R.M.*) or the low-rate meter (*L.R.M.*), and the switch is adjusted by the balance weight or by the air-gap so that all currents less than a given fraction of the maximum current (5 to 25 per cent) are registered on the low-rate meter. In Fig. 4 a separate power circuit is used, connected to the switch as shown, and two meters are, therefore, necessary under ordinary rate conditions. The low-rate meter will, therefore, register the whole of the motor load, and up to 25 per cent of that required by the lighting when the switch is on the low (or left-hand) side. When the switch is on the high (or right-hand) side, the low-rate meter will measure the power only and the high-rate meter the lighting only. With the arrangement shown in Fig. 5 the consumer has the option of these connections provided certain heating apparatus, such as a complete cooker, a system of radiators or other power, is adopted, whether purchased outright or hired. So long as the heater system is in use the low-rate meter will measure all power and any desired proportion of the lighting, since the pull of the magnet is neutralized to the required extent. Otherwise the operation is the same as in Fig. 4; that is to say, the lighting reverts to the high-rate meter after 5 to 25 per cent has been exceeded. To provide equal and opposite

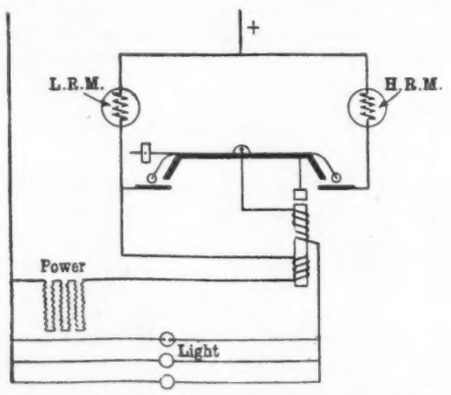


FIG. 5—CONNECTIONS FOR COMBINED MOTOR AND LAMP SERVICE

magnetizing ampere-turns with equal current flowing in each circuit would court financial ruin if the heating system were maintained over the lighting peak. It is probable, therefore, that the opposing forces would generally be designed so as not to have a greater ratio than 1:2, or even as low as 1:4, until heating apparatus reaches a very much higher point of efficiency and commands a ready sale to every consumer. Provided always that the heating peak (assuming that there is only one) does not coincide with the lighting peak in magnitude and length of time, the arrangement of Fig. 5 should undoubtedly prove acceptable.—London *Electrician*, Nov. 21, 1913.

Synchronous Running of Motors.—A note on a recent British patent (No. 23,669, 1912) of W. E. Lake and the Société Anonyme du Temple, France. The principle of controlling a motor from a distance by placing it on the diagonal of a Wheatstone bridge is employed. According to the present invention, two shafts, one at a transmitting and one at a receiving station, may be started and stopped simultaneously or driven at the same speed. The two shafts carry two commutator rings and a commutator for putting the controlling resistances into circuit. The resistances of the commutators form part of a bridge the diagonals of which compose the dynamo field magnets. These are set in motion as soon as there is any angular displacement between the two shafts so as to vary the resistance couples and establish synchronism.—London *Elec. Eng'ing*, Nov. 13, 1913.

Electrophysics and Magnetism

Efficiency of the Electromagnet.—L. Schüler.—A translation of his recent German paper in which a method is described for calculating the coil current and the armature speed of an electromagnet at all moments from that of switching on the current to the completion of the stroke. By plotting the time-curves of these values the electrical input and the mechanical output during the stroke can be found, and thence the efficiency of the electromagnet is obtained. Different examples are given for both direct-current and alternating-current supply. It is further shown that with alternating current the working conditions are much affected by the point of the pressure-curve at which the apparatus is connected to the supply circuit.—London *Electrician*, Nov. 14, 1913.

Theory of Gravity.—S. B. McLaren.—A highly theoretical and mathematical paper in which the author discusses the principles of relativity and Riemann's theory of gravity and then develops a mathematical theory of gravity under the following ten chapter topics: Relativist hydrodynamics; least action in electrodynamics; time and the fourth dimension; electrodynamics in four dimensions; the Newtonian potential a velocity potential; matter and "ether"; energy, momentum, and stress; positive and negative charge; magneton and electron; the electromagnetic equations in moving ether, and the limits of mechanical theory. The author's idea of the constitution of matter is that there is but one ultimate substance, a fluid whose density and motion are everywhere continuous. The substance has, however, two forms, "matter" and "ether," which are exclusive one of the other. Matter is a region where the fluid grows or decays. In this process the momentum of the ether "born" or "dying" is acquired from the surrounding ether, and all momentum is that of the one fluid substance.—*Philos. Mag.*, October, 1913.

Radium Deposit in the Electric Field.—E. W. Wellisch.—An account of an experimental investigation continuing former researches of the author on the distribution of the active deposit of radium in an electric field. In the present investigation the object was to determine the effect of using containing vessels of different dimensions and of mixing the emanation with gases other than air. In addition it was aimed to make a detailed investigation of the distribution when small potentials are employed. The main experimental results of the previous research were confirmed, but the fresh results obtained necessitate a modification of the theory which was formerly suggested in explanation of the phenomena.—*Philos. Mag.*, October, 1913.

Radium.—Joh. Harden.—An article on the Radium Institute at St. Joachimsthal.—*Metal. and Chem. Eng'ing*, December, 1913.

Electrochemistry and Batteries

Ozone.—A. VOSMAER.—An article on the manufacture of ozone, its properties and uses in daily life and therapeutics and its industrial applications for bleaching, etc.—*Metal. and Chem. Eng'ing,* December, 1913.

Gas Battery.—KARL SIEGL.—The author discusses the essential features of the Grove gas cell and describes a new gas cell for which he claims an output of 100 or even 1000 times that of the Grove cell. This result is obtained by using the electrodes of a special form. Platinized carbon grains of 3-mm diameter are placed in flat clay cells which at the same time form the gas chambers. These also contain the carbon plates which make connection with the external circuit. The clay cells are filled with electrolyte. In this way a large electrode surface is obtained. Any number of such clay cells are placed in a container, being arranged alternately positive and negative. It is claimed that the cost of operation and maintenance is less than with other primary batteries.—*Elek. Zeit.,* Nov. 13, 1913.

Electric Steel Furnace.—E. M. SCHMELZ.—An illustrated description of a new electric steel-casting plant at Redondo, Cal. This is the first installation of an electric steel furnace of the pure Stassano type in the United States. Some differences in the design from the former Stassano furnace are pointed out.—*Metal. and Chem. Eng'ing,* December, 1913.

Units, Measurements and Instruments

Electrostatic Oscillograph.—H. HO AND S. KOTO.—An abstract of a (British) Physical Society paper in which the authors describe an electrostatic oscillograph suitable for recording very high voltages. Two vertical bronze strips pass symmetrically between two parallel metallic plates called "field plates." These are connected at their lower ends by a silk fiber which passes under an ivory pulley. An extremely small mirror is fixed to the strips. This arrangement constitutes the vibrator, which, mounted on an ebonite frame, is immersed in an oil bath. To the upper extremities of the strips are connected the terminals of a 300-volt direct-current source of emf. The alternating-current voltage to be recorded is connected to the field plates in parallel, and in series with these plates are arranged two oil condensers. The electrical midpoint of the direct-current battery is connected to a point between the condensers. The turning moment on the strips is proportional to the product of the momentary values of the alternating-current voltage, so that if the latter is constant the deflection of the mirror accurately follows the variation of the former. Oil plays an important part in the action of the device, not only acting as a damping agent and insulator but increasing the instrument's sensitiveness on account of the oil's high dielectric constant. In cases where the voltage is low but the source of energy is so limited that sufficient current cannot be taken to actuate the ordinary oscillograph the electrostatic vibrator may be used by applying the voltage in question to the strips, while the terminals of a high-tension battery or an influence machine are connected to the "field plates." The instrument may also be used for recording very small currents by replacing the oil condensers by two exactly equal resistances, which are traversed by the current.—London *Electrician,* Nov. 14, 1913.

Telegraphy, Telephony and Signals

Sine-Wave Telegraph Transmission.— H. W. MALCOLM.—The conclusion of his long illustrated mathematical serial on sine-wave transmission in submarine telegraph cables. In the present instalment the semi-period signal at the sending end and the deformation of the semi-period signal in transmission are discussed. The final conclusion of the author is that a sine wave of emf with equal conditions of maximum stress on the cable will give the same signals at the receiving end as the square-topped wave at present employed. At the sending end, on the other hand, the rise in voltage due to the sinusoidal emf is a more gradual one, tending to facilitate the preservation of the duplex balance. Moreover, the sine-wave transmitter has certain characteristics which are wanting in the battery. Thus it possesses great adaptability, containing within itself both generator and transmitter. Phase relationship and wave-shape are perfectly under control, rendering it for experimental purposes invaluable. By its aid the effective values of the cable constant, particularly of the inductance, could be determined, numerical data for which are long overdue. In telephony the change has been from primary battery to secondary cell, and more recently to dynamo operation. It is not unreasonable to suppose that the same change may follow in cable telegraphy.—London *Electrician,* Nov. 14, 1913.

Miscellaneous

Preece.—A long obituary, with portrait, of the late Sir William Henry Preece.—London *Electrician,* Nov. 14, 1913. Another obituary, from the pen of Sir John Gavey, appears in London *Elec. Review,* Nov. 14, 1913.

German Commercial Statistics.—FASOLT.—The first part of an article on the position of the electrical industries in the commercial statistics of the German government. The article is to be concluded.—*Elek. Zeit.,* Nov. 13, 1913.

Effect of Mining on Tramways.—NOLDEN.—The first part of an illustrated article on the deleterious effects of mining operations on street railways and buildings due to sinking of the ground. Methods of avoiding such damage are discussed.—*Elek. Kraftbetr. u. Bahnen,* Oct. 14, 1913.

Young Electrical Engineers.—A long editorial on the prospects of the young electrical engineer in Great Britain.—London *Electrician,* Nov. 14, 1913.

Book Reviews

DIE FUNKENTELEGRAPHIE. By H. Thurn. Leipzig: B. G. Teubner. 128 pages, 58 illus. Price, 1.25 marks.

A handy little treatise on radio-telegraphy and radio-telephony, already in its second edition, giving an outline of the history, principles and mode of operation of Hertzian-wave communication. The book is divided into four sections, dealing respectively with the following topics: wireless telegraphy, wireless telephony, influence of radio-telegraphy on commerce, radio-telegraphy in international law. A good chapter deals with the regulations adopted at the international conventions of 1906 and 1912 on radio-telegraphy. The book will be of interest to radio-telegraphic students interested in the German point of view.

COMMON BATTERY TELEPHONY SIMPLIFIED. By Walter Atkins. New York: D. Van Nostrand Company. 164 pages, 150 illus. Price, $1.25.

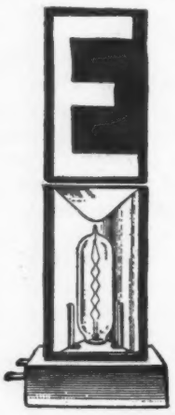
A knowledge of the fundamental principles of electricity which render possible the reproduction of speech over long distances is assumed in this book. The volume is essentially one for the practical telephone man and modern student. It does not deal with the history of the science of telephony nor with the operation of magneto systems except to explain the operation of small magneto instruments often found in installations where the distance between instruments and the exchange is too great for a common-battery system to be practical. The exchange operation explained in the main portion of the book is known as the 24-volt system and is the one used in all but a few of the installations of the British Post Office. Brief descriptions are given of other types of exchanges. All wiring diagrams are presented in a simplified form. Automatic operation is not mentioned. The book contains appendices dealing with exchange cables, color scheme and measuring resistance by voltmeter.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Interchangeable Sectional-Unit Interior Sign

An interchangeable sectional-unit electrically lighted sign for window advertising has been put on the market by Stanley & Patterson, of New York. In the accompanying illustration is shown a single unit with the glass letter slide removed. Each section consists of a black-japanned metal reflector top, a cameo-glass slide, a tubular lamp and a porcelain base which has contact blades to connect it with the base of the adjacent unit. The base of each section fits in a brass channel, and spacer units are provided to separate words. The circuit wires are connected to an attachment spacer. Although primarily designed for night advertising, the sign can also be used in the daytime.



SIGN UNIT

Special fixtures are provided for making the sign multiple-line. The sign may be made larger or smaller and the number of words or lines can be changed in a very short time on account of the unit design. This feature gives great flexibility to the device.

Window-Display Platform

The Midas "mystery" platform illustrated herewith is used to focus attention on an advertised article. It consists of an ebony case with a mirror top. The article rests on a pad or platform which is made to move to and fro on the top of the mirror by means of an electromagnet underneath.

DISPLAY PLATFORM

The device is being placed on the market by the Mercantile Advertising Company, 1328 Broadway, New York, and the 1/20-hp motor used in its operation is made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

Light-Weight Electric Delivery Wagon

The Van Auken Electric Car Company, Chicago, is manufacturing a low-priced electric delivery wagon in which both weight and number of wearing parts have been considerably reduced, minimizing further the already low operating and maintenance expense characteristic of electric vehicles. The wagon weighs only 1625 lb., being designed for light-package service and a maximum load of 750 lb. Only one style of chassis is made at present, although two designs of bodies can be furnished—a covered type with back doors and an open wagon with stake or flare sides. Fully equipped with batteries, instruments, electric lamps and horn, the Van Auken car sells for $1,000. Where road conditions are good and the route traversed is practically level, it is declared that the batteries will give more than 50 miles per charge with a load of 750 lb. and a maximum speed of 12 miles per hour.

INEXPENSIVE LIGHT-WEIGHT ELECTRIC DELIVERY WAGON

The battery, consisting of sixteen "Hycap Exide" cells, is carried in two separate trays, each holding eight cells, suspended at the extreme ends of the chassis. The cells are accessible for flushing and for inspection, and may be removed readily as the trays clear the ground by about 15 in.

A continuous-torque motor and a rotary-type controller are employed, being placed close together to avoid using long leads. The wire used has unusually liberal cross-section, making the I^2R losses low. The motor is connected with the rear wheels through a short propeller shaft, two simple universal joints and the differential gears. Under normal load there is a straight-line drive between the armature and the pinion gear. Flush-type head-lamps are installed in the dashboard.

The manufacturers declare that a battery charge for this vehicle will cost from 40 cents to 60 cents, depending on

the local rate for energy. Under average conditions the cost of energy per ton-mile would therefore be about 3 cents.

Universal-Unit Battery-Charging Panels

The universal-unit charging panel shown in the accompanying illustrations has been put on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., and is designed particularly for electric-vehicle stations where the charging equipments are apt to be suddenly increased, necessitating a quick change in the switchboard apparatus. The panel is made up of self-contained rheostats assembled in frames in much the same way that sectional filing cabinets are put together, each panel accommodating from one to six sections. Any number of panels can be put side by side. This may be done at different times, and the complete equipment will appear as if installed at one time. These panels are for both two-wire and three-wire circuits.

Each charging section is a unit in itself as shown in Fig. 1. It consists of a slate front 24 in. by 10 in., which carries the rheostat contacts and sliding brush; a low-current circuit-breaker on the left; an instrument switch on the right, and a pilot lamp and grid-type resistor mounted on the back. Each section is supported by bolts to the frame and after being disconnected from the busbar can be readily removed by taking out the bolts.

The low-current circuit-breaker mounted at the left of the front is interlocked with the rheostat so that it cannot be closed unless the sliding brush is moved to the position of "all resistance in." It can then be closed, a small magnet which is in series with the charging circuit holding it in this position in case the charging voltage should fall to a value less than the battery voltage or the service fuses should be blown. The breaker thus acts as a line switch.

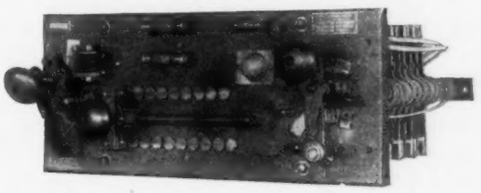


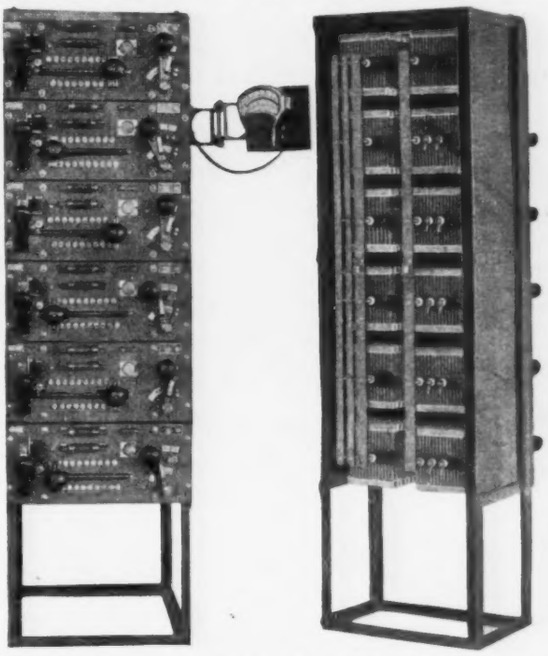
FIG. 1—INDIVIDUAL CHARGING SECTION

The instrument switch is a three-position switch having "open," "closed" and "reading" positions. When in the "open" position the circuit to the battery is broken; moving to the "closed" position completes this circuit, and when in the "reading" position the meter, which may be mounted on the top section or on a swinging bracket, is connected in the battery circuit and indicates the voltage of the battery. If the low-current circuit-breaker is closed, the current is also indicated on the ammeter scale of the instrument.

A combined ammeter and voltmeter furnished with the apparatus can be used for several panels, if desired. The indicating pilot lamp is connected directly across the battery leads and is lighted whenever a battery is connected to the rheostat.

A discharge rheostat is sometimes mounted on the top section of the panel to operate in conjunction with the charging rheostat section directly below it. A single-pole, double-throw switch short-circuits the discharge rheostat directly to the line. When closed to the right, the switch connects the discharge rheostat in series with the charging rheostat, connection being made so that the battery will discharge when the instrument switch is closed.

In Fig. 2 is shown a front view of the panel. The rheostat is mounted adjacent to the controlling switch, thus eliminating the possibility of operating the wrong rheostat. Meter readings can be made without opening the charging circuit. The voltage and current may be read at any time by moving the corresponding instrument switch to the "reading" position. Not more than one of these switches should be operated at one time, but in case any one through ignorance moves two at one time no damage will result, because the voltmeter connections are arranged in such a manner that the cross-currents resulting are made ineffective. When it is desired to stop the charge the circuit is opened by moving the instrument switch to the "open" point, the arc formed on opening the circuit being taken on the auxiliary contacts which are provided with the magnetic blowout. This opening of the circuit de-energizes the low-current circuit-breaker, which opens, disconnecting the battery from both sides of the line. When the plug is removed from the vehicle the charging cable is dead.



FIGS. 2 AND 3—FRONT AND REAR VIEW OF SIX-SECTION BATTERY-CHARGING PANELS

Static-Electricity Remover for Printing Presses

A new device for removing the static electricity that gathers on the paper of large rotary printing presses in cold weather, and at the same time drying the ink on the paper, has been designed by Mr. A. F. Allsop, of the Commonwealth Edison Company, Chicago, Ill., and is manufactured by the Chicago division of the General Electric Company. The device heats the air surrounding the paper, and the convection air currents dry the ink and carry off the static charge with the moisture.

The apparatus takes up very little space and can be attached to or removed from the press at will. It consists of a panel made of transite board, 60 in. long and 9 in. wide, upon which are mounted four resistor-type heater tubes, each 22 in. long and 2 in. in diameter. These are insulated with a special compound and are arranged in two rows. Two switches are also mounted on the panel, each controlling one row of two tubes, thus giving a variable control of the heat. The device consumes a maximum of 2000 watts, each tube being rated at 500 watts.

STATIC-ELECTRICITY REMOVER

Motor-Driven Coal and Ash-Handling Equipment at Pacific Mills, South Lawrence, Mass.

In the power plant of the new print works of the Pacific Mills, South Lawrence, Mass., there has been installed an unusual coal and ash-handling equipment, the operation of which is part manual and part electrical. The first part of this interesting equipment consists of a pivoted bucket conveyor which receives the coal from the railroad cars and distributes it into the storage pocket. In addition to this conveyor a motor-driven car distributes coal to sections of the storage pocket not reached by the conveyor. Charging cars and a narrow-gage railway convey coal from the storage pocket to the boiler room, and another narrow-gage railway system is used for the removal of ashes.

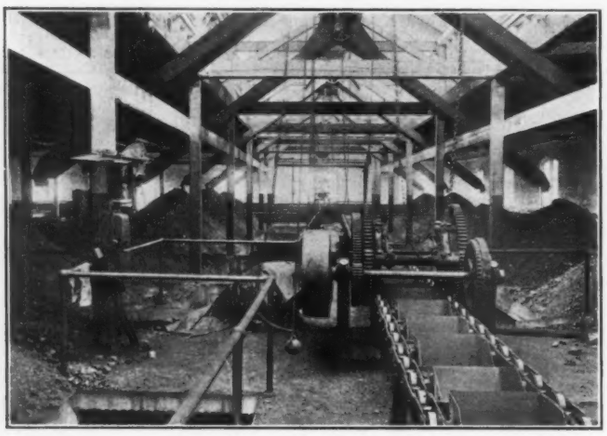


FIG. 1—BUCKET CONVEYOR WITH MOTOR-DRIVE

Coal is brought to the plant in railroad cars of the bottom-dumping type and is distributed directly into a pit under the track. It then passes into an electrically driven coal crusher. This crusher discharges through a revolving filler to a pivoted bucket conveyor which runs through a tunnel and then rises with the coal to the distributing chutes, each of which is provided with an automatic trip so that the coal can be discharged from the conveyor buckets into any chute desired. The conveyor is driven by an open-geared pawl driver located on the upper level.

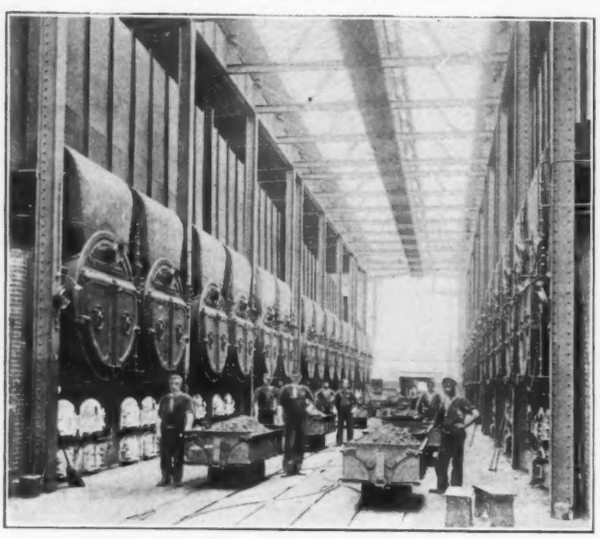


FIG. 2—SWITCHING FACILITIES IN BOILER ROOM

Besides the coal pocket shown in Fig. 1, there is an auxiliary row of storage bins at the extreme left of the building. For filling these bins the conveyor can be arranged to discharge into an auxiliary hopper (Fig. 3) used for filling an electrically operated car of 2 tons capacity, running on a track over the storage bins. The bins have a combined capacity of 10,000 tons of coal, but are subdivided so that the individual bins can be emptied in a few minutes in case the coal commences to heat and there is danger of spontaneous combustion.

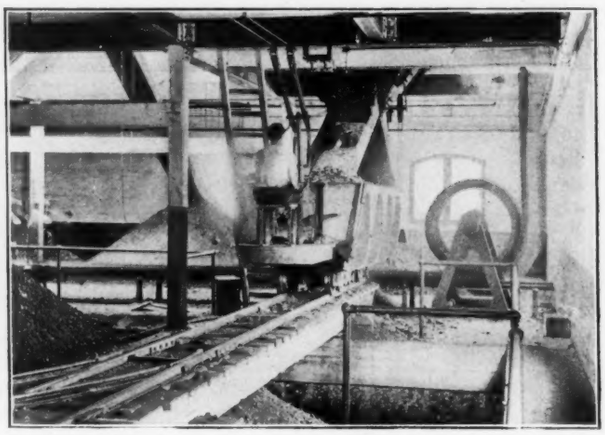


FIG. 3—FILLING 2-TON COAL CAR

From the bins shown in Fig. 1 the coal is drawn off through duplex valves into the boiler-room charging cars. Although these cars are of 1-ton capacity, they can be filled in less than a minute. When filled the charging cars are pushed by hand to the scales, where a complete record of all coal burned is kept. From here the cars are taken directly into the boiler room (Fig. 2). The two outside tracks are located so that the fireman merely drops the side of the car and shovels the coal directly into the furnace. The middle track provides for shunting out empties and running in full cars. As will be noted from the illustration, this system prevents coal from being spilt around the floor and permits of maintaining a neat boiler room. The coal cars, being designed especially to facilitate firing the coal into boilers, are made of sheet steel stiffened with angle iron, with the corners rounded off for the workmen's hands. When the side door is let down its bottom is slightly higher than the floor of the car, so that the fireman will not catch his shovel when scooping up the coal. These cars greatly reduce the fireman's work and increase his coal-handling ability. The cars have outside-flanged

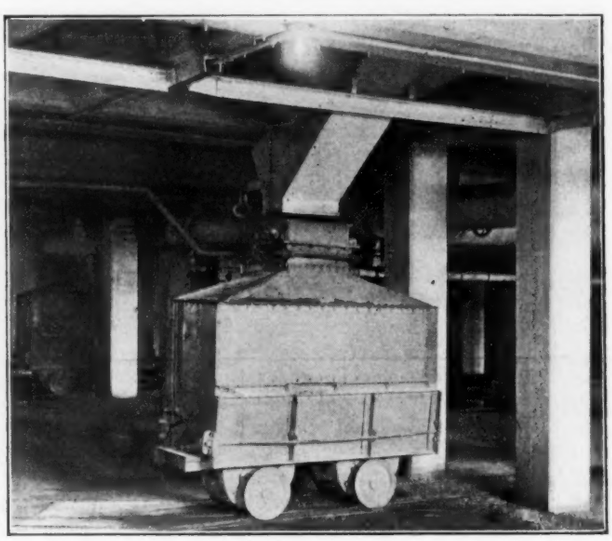


FIG. 4—DUST-PROOF ASH CAR

wheels, permitting one man to push easily a 1-ton load around a curve of 12-ft. radius, since in taking the curves the outside wheels run on their flanges so that the tread of the inner wheel and the flange of the outer one fall upon the theoretical cone of revolution. The coal-conveying equipment is capable of handling from 60 tons to 70 tons of coal an hour, which is more than ample to keep the thirty boilers supplied when running at full load.

Fig. 4 shows the method of removing ashes in the room underneath the boilers. The ash car is interesting as it has been designed to be practically dust-proof. As soon as the car is run under the ash hopper a lever at the top of the car is pulled down and a telescoping spout on the car encircles the bottom of the ash hopper to prevent ashes from flying out into the room.

This coal and ash-handling system was designed by Lockwood, Greene & Company, Boston, Mass., and the apparatus was supplied by the C. W. Hunt Company, Inc., West New Brighton, N. Y. The coal pockets, which are of reinforced concrete faced with brick, were built by the Aberthaw Construction Company, of Boston.

Suction Lifter for Use with Punch Presses

A new device for minimizing the toll of injuries to the hands and fingers of operators of stamping and punch press machines is the suction lifter shown herewith. In making laminations for small motors and in producing sheet-metal parts of various designs, operators of punch presses often suffer severe injury by getting their hands or fingers caught in the descending dies. The suction lifter illustrated is in use in the Westinghouse shops, East Pittsburgh, Pa., and has demonstrated its value on many occasions.

In manipulating this tool the operator holds his thumb over the protruding button at the upper end of the handle grip. When the cup-shaped disk at the end of the rod is placed on the piece of metal to be lifted, pressure of the thumb on the button opens the air valve in the handle and creates a suction through the hole in the center of the milled slot in the screw. The disk is faced with rubber, insuring good contact with the metal. As long as the valve is open the vacuum in the pipe line holds the sheet metal against the rubber. Release of the thumb pressure on the button immediately drops the stamping. For removing small and irregular pieces of scrap from the plate of the machine a hook has been added at the side of the disk, as shown. A battery of three air pumps driven from the same countershaft as the presses maintains a constant vacuum on the pipe lines to all machines. Similar lifters, working on a system of levers, are made in large sizes for handling heavy stock.

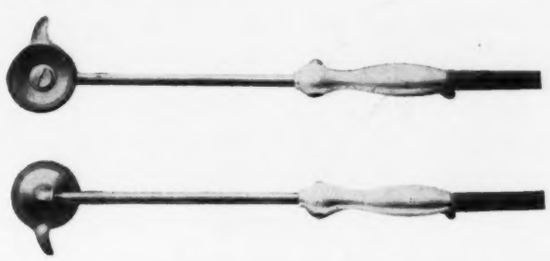


FIG. 1—SUCTION LIFTER FOR USE WITH PUNCH PRESSES

The idea of this lifter came to one of the men in the stamping room while he was watching a Hungarian workman trying to use an oiling brush to place the sheet metal beneath the die. A suggestion to the works department of safety, deposited in one of the boxes placed throughout the plant, resulted in the design shown herewith.

Following the adoption of these suction lifters on a battery of stamping machines the output was increased 20 per cent, and although no accurate data can be obtained regarding the number of injuries prevented, it is safe to assume that the number would be large. Previously the company's physicians treated crushed fingers every few days, while now it is said that such injuries are rare. To remove further the danger to the operators of these stamping machines the horizontal faces of the die holders are now beveled, as in Fig. 2, so that the only part which can actually strike the hands of the operator is the die itself.

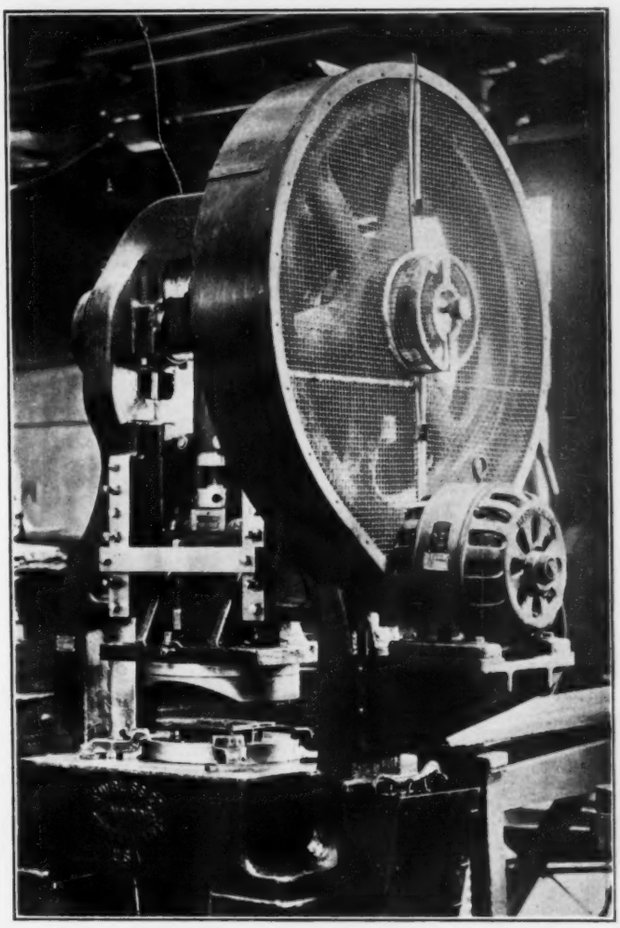


FIG. 2—PUNCH PRESS WITH CHAMFERED DIE PLATE AND PROTECTED GEARS

Repulsion-Type Fuse

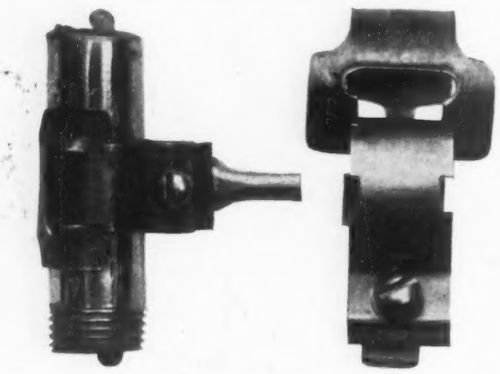
The Metropolitan Engineering Company, Brooklyn, N. Y., has developed and is putting on the market a repulsion-type fuse. This protective device consists of a porcelain base, copper contacts, a mica arc shield and a strip of fuse metal. The copper contacts are made in thin sheets and are formed so that they will slip over the outside of the porcelain base. Small clips integral with the copper sheet are bent down to hold the contacts in place. The fuse ribbon is carried over the fan-shaped piece of mica, and where it crosses the mica edge the metal section is reduced to insure rupture at this point. When the fuse blows the action of the gases repels the broken ends of the metal ribbons from the mica, separating them as widely as their length will allow and interposing the additional mica barrier. The fuse metal, however, is the only part injured by the arc, and by slipping the copper covering off the porcelain block a new piece of fuse metal may be inserted and the other parts replaced without the use of tools. The fuse

metal parts are small and of inconsiderable weight, thus making it readily possible for the workmen to carry them in their pockets.

These fuses have been approved by the National Board of Fire Underwriters and are being made in sizes ranging from 10 amp to 400 amp. Experimental work is also being done on other sizes.

Grounding Clamp

The clamp shown in the illustration herewith is designed for the purpose of connecting ground wires to small pipes. It is made of two copper strips bent partly in circles as shown, one strip having notches for different sizes of pipe and passing through a slot in the other in such a manner



METHOD OF FASTENING GROUNDING CLAMP TO PIPE TO GAIN UNIFORM CONTACT

that the latter partly overlaps the former. Extensions of the two strips are fastened together by a stove bolt and a uniformly firm contact results. One of the strips is brought out beyond the bolt and is bent together so as to inclose the wire, to which it is soldered, this part being tinned to facilitate soldering. The clamp was designed and is marketed by Robert R. Forbes, of Mount Holly, N. J.

Spray Method for Painting Small Objects

The machine shown in the accompanying illustration is being used successfully for covering comparatively small

TABLE AND MOTOR-DRIVEN PLATFORM FOR PAINTING SMALL OBJECTS

objects with paint, japan, enamel and lacquer. The article to be painted is placed on the elevated platform, which is rotated by a small motor mounted under the table. The paint is sprayed on by compressed air, thus covering the article more rapidly than is possible with brush work and reaching all parts of carvings, irregularities, etc., without showing any brush marks.

When the paint used is such that its fumes must be removed, the revolving stand can be mounted inside a hood, which is provided with a motor-driven ventilating fan to drive the fumes away.

This painting device is manufactured by the De Vilbiss Manufacturing Company, Toledo, Ohio. The motor used in its operation and the ventilating fan are made by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

Front-Wheel Individual-Motor Drive for Electric Truck

Striving to obtain maximum efficiency of mechanical transmission from the driving motor to the rim of the wheel, the Clarence L. Smith Company, New York City, is making a "couple-gear front-drive attachment" which may

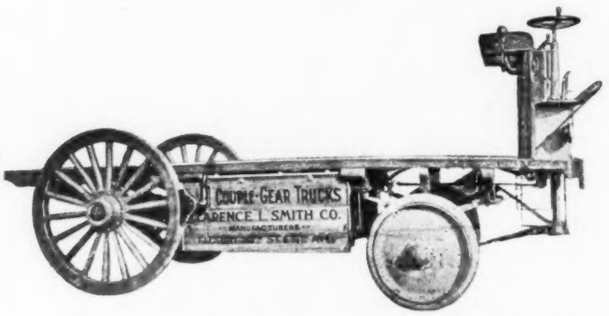


FIG. 1—TEAM TRUCK CONVERTED TO COUPLE-GEAR DRIVE WITH MOTORS CONTAINED IN FRONT WHEELS

be used with existing wagon bodies. The battery box is slung under the bed of the wagon and the motors are contained in the front wheels as shown in the illustration. The dissembled view shows the motor with one side of the wheel and half of the frame removed. The armature is mounted at a slight angle to the plane of the wheel so that the two pinions may engage their respective halves of the double cog racks on the sides of the wheel. Both pinions run in the same direction, one engaging a rack at each side of the wheel. Balanced division of the work between them is accomplished by means of a rocker device or "evener." The axle stubs on which the wheel turns are integral with the motor frame, the inside stub being keyed into the steering knuckle. One motor is placed in each

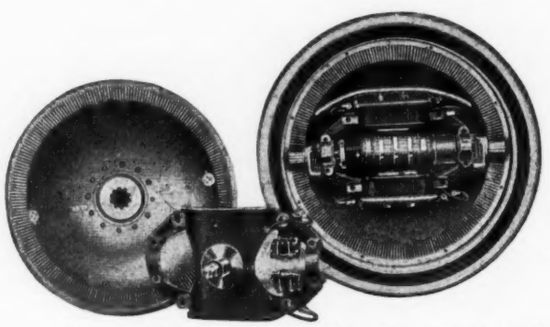


FIG. 2—COUPLE-GEAR CONSTRUCTION FOR TEAM TRUCK CHANGED TO ELECTRIC DRIVE

front wheel, and for a 6-ton truck each of these motors is rated at 3 hp, 88 volts. The battery on a truck of this size is made up of forty-four cells of the Philadelphia Storage Battery Company's medium-thin plate batteries, with a 343-amp-hr. rating. This equipment, it is claimed, will give from 30 miles to 35 miles a day, with an efficiency of 97 per cent.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Drawback Allowances Made on Electric Lamps.—A drawback allowance was granted recently to the General Electric Company by the Treasury Department upon the exportation of electric-lamp fixtures manufactured at the Cleveland plant of the Ivanhoe Metal Works, in which fixtures there were used imported sockets and holders in connection with other parts of domestic manufacture.

Shipping Storage Batteries in Charged State.—The Baltimore Storage Battery Company, which does a large export business in storage batteries for starting, lighting and ignition service on automobiles, has devised a method for shipping batteries in a charged condition, without the acid. To accomplish this, the battery case must be air-tight, so that when the charge has been given and the acid drawn off no air can enter and touch the plates. Upon its arrival at its destination the battery can be put in service by pouring in the necessary acid and charging for a short period.

Edison Battery Not to Be Changed.—In a recent communication from the Edison Storage Battery Company mention was made of a new type of miners' safety lamp which that company is developing. Through an error the statement was made in the Nov. 22 issue of the *Electrical World* that a new type of storage battery was being developed, which is not the case, as is shown in the following statement, issued by Mr. Edison, in contradiction of the above note: "I wish to say that the alkaline battery is to-day practically the same as when placed on the market some five years ago, and that there is positively no truth in the rumor that a new type is to be manufactured."

Miniature Lamps Being Boomed.—In order to place the merchandising of small electric lamps for various uses on the same basis of high efficiency that the sale of ordinary incandescent lamps has attained, there was recently organized at Cleveland in connection with the National Lamp Works of the General Electric Company what is called the department of miniature lamps. Paul M. Bauder was placed in charge of this department, and under his direction an active campaign of advertising and co-operation with the jobbers in that line was started. The department is a headquarters for ideas to help dealers in their sales, and information is given out in various forms as to the latest window displays and selling methods.

How the Big Electrical Companies' Shares Are Held.—The General Electric Company and the Westinghouse Electric & Manufacturing Company, combined, have close to 20,000 shareholders at the present time, the former concern having about 1000 more than the latter. The combined capital of the two companies is over $142,000,000, of which about $40,650,000 represents the capitalization of the latter company. The Western Electric Company, with a capitalization of only $15,000,000, is expected to do a business of $76,000,000 this year, while the sales of the General Electric Company will probably reach approximately $100,000,000 and those of the Westinghouse company about $48,000,000. While the dividend rate of the Western Electric Company is higher than that of either of the other concerns, the difference is not so great as the above figures would indicate, since the balance available for dividends is in its case a much smaller proportion of the total sales than for either of the other two companies.

Wireless Telegraph Activities.—Two new applications of wireless telegraphy have recently come to light. For about three weeks there has been a series of tests in progress between the stations at the Eiffel Tower, in Paris, and the United States government stations at Arlington, Va., by which it is hoped to determine the exact difference in longitude between those points. The beats of a clock in the French metropolis were sent by wireless and compared with those of a clock at the American station. Of perhaps greater importance is the experiment recently made of providing wireless-telegraph service on railroad trains. On Nov. 21 one of the trains out of New York on the Delaware, Lackawanna & Western Railroad carried a wireless outfit and operator, together with a number of engineers interested in the test. Communication was established between the train and several important centers on its route and, while the experiment was not entirely successful, it indicated the possibilities, and further tests are to be made.

Growth of Commercial Electric Vehicle Sales.—Speaking of the electric truck as a success for delivery and haulage purposes, J. M. Lansden, second vice-president of the General Motors Truck Company, Detroit, Mich., said to a representative of the *Electrical World*: "The solution of what appears to be one of the largest problems to be overcome by those who are working out the marvelous merchandising systems of American cities seems to lie in the development of the electric commercial vehicle. Although electric commercial vehicles have been in use for about two decades, it was not until about six years ago that they began to take an important place in our present-day scheme of haulage and delivery. To-day the electric truck is making the most extraordinary advances in its field for suburban as well as city uses. Last year the number of electric commercial cars used in some of our metropolitan cities increased considerably over 50 per cent."

Westinghouse Business with Public Utility Companies.—Among the recent purchasers of this company's product are the Charlotte (N. C.) Electric Railway, which has ordered one 60-kw rotary converter, three 275-kw single-phase transformers, one control switchboard and one fifty-lamp arc rectifier. There have been ordered by the Philadelphia Suburban Gas & Electric Company two 100-kva frequency-changer sets and two 150-kva, three-phase, 25-cycle, 13,200/2200-volt transformers. From the Connecticut Power Company there has been received, through the Stone & Webster Engineering Corporation, an order for three 500-kva, single-phase, 60-cycle, 66,000/2300-volt transformers and twelve 1000-kva transformers of the same type. An order has been placed by the Duquesne Light Company, of Pittsburgh, Pa., for two 200-kw induction-motor-generator sets, 125-volt direct-current, 220-volt, three-phase, 60-cycle alternating-current. The Westinghouse company is also in receipt of a recent order from the New Orleans (La.) Railway & Light Company for one 150-kw, 125-volt direct-current generator to be turbine-driven through reduction gears.

Samuel Insull on Business Conditions.—In a statement requested by a daily newspaper and made public on Nov. 26 Samuel Insull, of Chicago, said that there is no doubt that there is a recession in business. This recession is due not merely to national but to world-wide conditions. Capital has been absorbed in large quantities in non-producing lines, such, for instance, as the recent war in southeastern Europe. At the same time there has been a heavy demand for capital for trade and manufacturing, with the result that a money stringency has been created in Europe and in this country. Mr. Insull said he did not believe that the situation in the United States is entirely the result of political activity, although it is not improbable that tariff readjustments and uncertainty regarding the currency have had an effect in accentuating economic conditions. Mr. Insull expressed his belief that the return to a more favorable situation would be slow but certain. "I feel," he said, "that the improvement will be more rapid in those countries where the government takes a paternal interest in the industrial affairs of the land than in those where there is an attitude of hostility on the part of those in government authority."

New Jersey Manufacturer Increasing Generating Equipment.—The Hyatt Roller Bearing Company is installing an addition to its power plant at Harrison, N. J., consisting of a 750-kw, 480-volt, three-phase Curtis-General Electric bleeder-type turbo-generator with auxiliaries, and has provided space for two future units. The present plant consists of several 125-volt direct-current non-condensing engine units with an aggregate capacity of about 500 kw. The turbine will utilize the exhaust steam from the present engines, together with necessary live steam from the present boiler plant. Condensing water will be supplied from a spray pond system located on the property of the company adjacent to the Pennsylvania Railroad, and this pond will also serve as a fire protection reservoir. The new equipment is to provide power for a large number of induction motors, recently installed, which are now driven by a temporary service from the Public Service Corporation. This addition is being designed and installed by Walter Kidde, engineer and contractor, of New York City, under the general direction of C. I. Shirley, mechanical engineer of the Hyatt Roller Bearing Company.

Baker Motor Vehicle Company's Annual Sales Convention.—From Nov. 13 to 15, inclusive, the Baker Motor Vehicle Company, of Cleveland, Ohio, held its second annual sales convention, which is regarded by that concern as the most successful session of that nature that the company has ever held. Electric-vehicle dealers from every section of the country attended. The most marked characteristic of the entire convention was the spirit of broad recognition for the dealer which has been developed in the Baker Company through the past year. Every session was a dealer session. Dealers were made to feel from the start that it was their convention, and as they were on the firing line it was their suggestions that were wanted. This one factor is held responsible for the unusual success of the undertaking, as the dealers contributed and took away with them more real good sales material than in any previous instance. Among the Baker cars exhibited were the electric coupé and the double-drive worm-gear brougham, and great interest centered around these two new models. Every dealer had an opportunity to examine the cars carefully and question the Baker engineers on any point of construction. The result was an enthusiasm for the new cars that promises great sales activity throughout the Baker organization for the coming year. In his report to the convention, George H. Kelly, secretary of the company, stated that business for the past year had increased 25 per cent in pleasure car sales and 130 per cent in truck sales. In connection with the designing of 1914 models of pleasure cars the Baker company is planning a decided innovation. The services of the French designer of women's apparel, M. Paul Poiret, have been engaged for the design of the interior furnishings of their cars, and it is expected that some of the cars produced under this novel system will be exhibited at the big automobile shows early in 1914.

NEW YORK METAL MARKET PRICES

	Nov. 24 Bid.	Nov. 24 Asked.	Dec. 2 Bid.	Dec. 2 Asked.
Copper:				
Standard, spot*	.....	.....	.....	.....
	Selling Prices £ s d		Selling Prices £ s d	
London, standard, spot*	65 0 0		65 15 0	
Prime Lake	15.00 to 15.25		15.00	.....
Electrolytic	14.62½ to 14.87½		14.50 to 14.75	
Casting	14.50 to 14.62½		14.37½	.....
Copper wire base	16.00	.....	16.00	.....
Lead	4.35		4.10	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter	7.50		7.50	
Spelter, spot	5.30 to 5.35		5.15 to 5.20	
Tin, spot	39.25 to 39.65		38.50 to 39.00	
Aluminum:				
Prompt delivery	19 00 to 19.25		19.00	.....
Future	18.75 to 19.25		18.75 to 19.25	

***OLD METALS**

Heavy copper and wire	14.00	13.50
Brass, heavy	9.00	8.75
Brass, light	8.25	7.75
Lead, heavy	4.20	4.20
Zinc, scrap	4.37½	4.37½

***COPPER EXPORTS**

Total tons to Dec. 2 2,022

*From daily transactions on the New York Metal Exchange.

Corporate and Financial

Initial Dividend of the Electrical Properties Corporation.—An initial quarterly dividend of 1½ per cent has been declared on the $4,000,000 preferred stock of the Electrical Properties Corporation, payable on Dec. 10. The accrued dividends on the stock of the Electrical Properties Company were adjusted when the corporation succeeded it on Sept. 1, 1913.

Generating Equipment Installed by Oklahoma Utilities.—From Tulsa, Okla., we have received word that additional generating equipment is being provided for two of the local utility interests. At the Tulsa station of the Public Service Company of Oklahoma there are being installed new boilers and a 1000-kva Curtis General Electric turbo-alternator. The Sand Springs Railroad Company is installing a number of 250-kva gas-engine-driven generating units.

New Hampshire Utility Purchased.—The stockholders of the Manchester (N. H.) Traction, Light & Power Company have voted in favor of the purchase of the $600,000 capital stock of the Nashua Light, Heat & Power Company. The former concern already controls the Manchester Street Railway, the Manchester & Derry Street Railway and the Manchester & Nashua Street Railway, and has absorbed since its formation a number of electrical utilities in that neighborhood.

Electric Merger in Missouri.—The Missouri Public Service Commission has granted the application of the Jefferson City Light, Heat & Power Company for permission to purchase the Jefferson City Bridge & Transit Company. The purchasing company will be permitted to issue $1,000,000 in bonds for improvements and extensions of the system. This is the first Missouri property outside of St. Louis acquired by the McKinley interests, which have large public utility holdings in Illinois.

Stock Increase for Massachusetts Utility.—The Worcester Electric Light Company, which serves the towns of Worcester and Leicester, Mass., has made application to the Gas & Electric Light Commissioners of that State for permission to issue $200,000 additional stock. The present authorized and outstanding stock amounts to $1,000,000 and was increased from $800,000 in 1911. The increase asked for is $200,000, which is to be sold for the purpose of retiring floating debt and for improvements.

Georgia Utility Completing Generating Station.—Work on the Tallulah Falls hydroelectric development of the Georgia Railway & Power Company is practically completed and its full capacity is available for the company's use. The big dam under construction at Mathis, 5 miles above the falls, is expected to be finished by March, 1914. The Tallulah Falls development was started before the formation of the present company and has been about three years in building. It has been paid for by the sale of $8,315,000 of the bonds of the Georgia Power Company, under which concern work on it was started.

United Gas & Electric Company Increases Its Board.—The board of directors of the United Gas & Electric Company will be increased shortly from fifteen to twenty-five. The new directors will be G. W. Bacon, J. Q. Gannon, W. P. G. Harding, A. H. Wiggin, A. J. Hemphill, F. M. Kirby, F. A. Sayles, R. L. Williams, F. V Hayne and S. Z. Mitchell. On Dec. 17 there will be a meeting of the stockholders of the company, in Hartford, Conn., when this plan will be brought up for approval. The acquisition of the properties of the American Cities Company recently is stated as the reason for this increase in the membership of the board.

Southwestern Power & Light Company Growing.—For the twelve months ended Oct. 31 the gross earnings of the Southwestern Power & Light Company subsidiaries amounted to $2,186,287 and the net earnings were $985,503. The Texas Power & Light Company, which is the principal one of these subsidiary concerns, is making many improvements in its properties at the present time. It has under construction now, at Waco, Tex., a new generating station and is building transmission lines between its various properties. The territory served by this company is growing rapidly and this growth is reflected in the increase in demand for electric energy.

CARRIER AND SLIDE GUIDE

Louisville Gas & Electric Company's Initial Dividend.—An initial quarterly dividend, payable Dec. 15, has been declared on the $10,787,800 of 6 per cent cumulative preferred stock of the Louisville Gas & Electric Company. The full quarterly rate of 1½ per cent is to be paid. It is planned to install two 5000-kw generating units in one of the gas plants recently acquired from the Louisville Heating Company, and the expjenditure of over $400,000 for this purpose has been approved by the directors. The former company expects to furnish a portion of the energy for operating the Louisville & Southern Indiana Traction Company's lines between Louisville, Jeffersonville and New Albany.

Malvern Light & Power Company Purchased.—The Malvern Light & Power Company, which supplies electric light and power, steam heat and ice to the towns of Malvern and Tabor, Ia., and to other small adjacent communities, has been purchased by the Continental Gas & Electric Corporation, of Cleveland, Ohio. The latter company has also acquired recently the small light and power plant at McCool Junction, Neb., and through the above properties, in addition to those held in Beatrice and York, Neb., and elsewhere, the last-named company serves in all about forty-five communities. The Continental Gas & Electric Company's capitalization consists of $1,250,000 common and $300,000 of 6 per cent preferred stock and it has outstanding $715,000 in 5 per cent bonds.

Columbus Reorganization Plan Approved.—The committee having in charge the reorganization of the street railway and electric light properties of Columbus, Ohio, at a meeting held on Nov. 26, 1913, declared the plan operative, as modified by the circular letter sent out on Nov. 10. Meetings of the stockholders of the various companies concerned have been called and, as a sufficient number of shares of stock have been deposited with the committee to carry out the plan, it only remains for the legal formalities to be complied with to bring about this reorganization, which has been under consideration for some months past. The plan as modified contemplates the union of the Columbus Railway Company and the Columbus Edison Company properties with the Columbus Railway, Power & Light Company property. The Columbus Light, Heat & Power Company property will be controlled under the lease to the Columbus Railway & Light Company, as it has been for some years past. Modification of the plan will cause some change in the arrangement by which the Columbus Railway & Light Company stockholders were to receive stock in the new company, on the dissolution of the former company, but the committee is working out a plan which, it is believed, will be satisfactory to these stockholders. The reorganization is expected to become effective about March 1, 1914, after the regular annual meetings of the companies affected.

Special Meeting of the Federal Traction & Light Company.—On Dec. 12 there will be held in New York City a special meeting of the stockholders of the Federal Traction & Light Company to vote on the following proposals: The execution of a trust agreement with the Columbia Knickerbocker Trust Company as trustee, dated Dec. 1, under which may be issued ten-year gold notes not to exceed an aggregate of $10,000,000, payable Dec. 1, 1923, bearing such interest not exceeding 7 per cent, and redeemable on thirty days' notice at such amount not exceeding 105 as may be fixed upon by the directors from time to time and designated on such notes when issued; the offering to the stockholders, for subscription at par and interest, of $750,000 of such notes, bearing interest at the rate of 7 per cent per annum and redeemable at 105 and interest up to and including June 1, 1921, and thereafter at par and interest; the execution of an agreement with a syndicate for the sale to it, at par and interest, of all of such $750,000 note issue as shall not be subscribed and paid for by the stockholders, and for the compensation of this syndicate for the above service; the issuing with the $750,000 notes of option warrants for common stock of equal par value, entitling the holders to obtain such stock at par at any time prior to Dec. 1, 1923, payment for such stock to be made in cash or by surrender of notes, issued under the above-mentioned trust agreement, which have been outstanding not less than two years and have not been called for previous redemption.

Business Notes

The Gould Storage Battery Company has announced the location of its Detroit office, on and after Dec. 1, as Boyer Building, 88 East Congress Street.

The Badt Westburg Electric Company, of Chicago, Ill., has recently announced the removal of its offices from Suite 1504 to Suite 832, Monadnock Block, Chicago, a change made necessary by the lack of room in its old quarters for the handling of a steadily increasing business.

G. M. Gest, underground conduit engineer, has removed his executive offices from 277 Broadway, New York City, to the Woolworth Building, New York. The headquarters of the New York Pole Company, an allied corporation, have also been transferred to the same address.

The Western Electric Company has just announced the following changes in its organization: A. E. Beling, formerly manager of the Western Electric Company's Pittsburgh house, has been appointed manager at Cleveland to succeed H. A. Speh, resigned, and L. M. Dunn has been appointed manager at Pittsburgh, succeeding Mr. Beling. J. L. Ray has been appointed sales manager.

The Diamond Electrical Supply Company, Inc., of Peoria, Ill., is the new name of the Mills Electric Company, which has been engaged in the electrical supply business in the Middle West for about eight years. The change in name was made to secure a distinctive and exclusive company name, and it has not accompanied any change in the management of the concern. H. M. Butler is president of the company; J. G. Butler its secretary and treasurer, and its sales manager is T. W. Endsley.

The H. W. Johns-Manville Company, of New York City, is providing increased accommodations for several of its branch offices at the present time. The Toronto branch of the Canadian affiliated company has been removed to 19 Front Street East. The Columbus (Ohio) branch is now located at 45 West Long Street. The Toledo office and warehouse have just been moved to 213 Water Street and the Cleveland branch has recently closed a long-term lease of a large warehouse on Front Street. Other Ohio offices, run in connection with the main office at Cleveland, are those at 717 National Second Bank Building, Akron; 259 Fourth Street Arcade, Dayton, and 502 Stambaugh Building, Youngstown.

New Industrial Companies

The Atlas Electric Sign Company, of Chicago, Ill., has been incorporated with a capital stock of $2,400 to manufacture and sell electrical signs. The incorporators are Alonzo W. Losee, Vernon C. Thompson and Ada Husum.

The Roland Gas-Electric Vehicle Corporation, of New York, N. Y., has been incorporated by P. K. Dexter, R. R. Conklin and S. L. Conklin, of New York, N. Y. The company is capitalized at $200,000 and proposes to do a general automobile business.

The Hammer-Beach Electric Company, of Geneva, N. Y., has been incorporated with a capital stock of $10,000 to do a general gas and electrical engineering business. The incorporators are Arthur H. Page, George L. Hammer and Henry C. Palmer, all of Geneva.

The Trioleum Power Company, of Providence, R. I., has been incorporated with a capital stock of $10,000 to develop, manufacture and sell fuel to be used in generating power, both motor and steam. The incorporators are Harlow W. Waite, John B. Desrosiers and Harry W. Stiness.

The Kleinschmidt Electric Company, of New York, N. Y., has been chartered with a capital stock of $100,000 to manufacture and deal in electrical apparatus. The incorporators are B. Kleinschmidt, W. Kleinschmidt and F. Kleinschmidt, all of 429 East Fifty-eighth Street, New York, N. Y.

The Walker Engineering Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $100,000. The company proposes to do a mechanical engineering and machinists' business. The incorporators are H. Walker, G. H. Walker, of Wilmington, Del., and F. F. Slocomb, of Philadelphia.

*From daily transactions on the New York Metal Exchange.

Trade Publications

Conduit Boxes.—A folder issued by the Chicago Fuse Manufacturing Company describes its new extension ring outlet boxes.

Flashers.—The Federal Sign System (Electric) in Bulletin No. 183 illustrates and describes its flashers. Bulletin No. 186 deals with prismatic signs.

Copper-Clad Wire.—The Duplex Metals Company, Chester, Pa., is mailing a leaflet containing a fac-simile letter from a steamship line referring to the dependability of copper-clad wire under exacting conditions. The leaflet is humorously illustrated.

Electric Heating Pad.—The H. W. Johns-Manville Company, New York, has issued a leaflet descriptive of its J-M electrotherm, a light, flexible pad composed of wires insulated and protected with asbestos, used in place of the familiar hot-water bottle.

Steam-Plant Economies.—Engineering Leaflet No. 15 of the Harrison Safety Boiler Works is entitled "Steam-Plant Economies Due to the Use of Hot Soft Water in the Boilers." It discusses the results obtained in treating the water when hot rather than when cold.

Single and Polyphase Motors.—Twin booklets recently issued by the Wagner Electric Manufacturing Company, of St. Louis, Mo., tell a lot about the latest products of that company in the line of single-phase and polyphase motors. The characteristics of these motors and their field of application are explained at length.

Insulators.—The Brookfield Glass Company, 2 Rector Street, New York, in a twenty-four-page booklet gives data on its insulators. Forty-five types are diagrammatically shown, accompanied with a brief mention of the weight, diameter of groove, number per barrel, approximate weight per 1000 and code word of each type.

Motor Applications.—"Motor-Driven Refrigerating and Ice-Making Machinery" is the title of a publication by the Westinghouse Electric & Manufacturing Company in which is given some interesting information on this subject, including specific data on motor applications, together with actual kilowatt-hours consumption for different plants.

Induction Motors.—Bulletin No. 160, recently issued by the Crocker-Wheeler Company, Ampere, N. J., refers to induction motors for general use, Form Q, 60-cycle, three-phase or two-phase. The bulletin is written for the average reader as well as for the engineer, which will insure for it a wide reading. The pamphlet is well prepared and neatly printed.

Storage Batteries.—Bulletin No. 111 of the United States Light & Heating Company, Niagara Falls, N. Y., describes and illustrates storage batteries for ignition and electric lighting. Included in the contents are useful data of storage-battery ratings, tables and formulas, which will facilitate the selection of the proper size battery for any special service.

Electric Stoves and Toasters at the Holiday Season.—The Hughes Electric Heating Company, 211-213 West Schiller Street, Chicago, has issued a holiday sheet for central stations and dealers in which it says that electric stoves, toasters and hot-plates make admirable Christmas presents. The sheet is printed in the Christmas colors and has a holiday appearance.

Wires and Cables.—The latest catalog of the National India Rubber Company, Bristol, R. I., represents an excellent example of high-grade trade literature, both as to contents and make-up. Within the 224 pages of this creditable volume are given descriptions of the various kinds and sizes of wires and cables manufactured by the company, in addition to which some valuable engineering data that will be appreciated by all wire and cable users are printed. The illustrations are exceptionally fine, notably those showing various kinds of wires, cables and lamp cords printed in the colors of the finished product. Sample strands of silk showing the many colors in which lamp cord is now made are mounted on a card for which there is a conveniently arranged pocket on the inside back cover of the catalog. There is also an excellent index. The entire character of this catalog will insure for it careful preservation.

Personal Mention

Mr. A. C. Moser has succeeded Mr. J. P. Mitchell as superintendent of the Bucyrus (Ohio) Light & Power Company.

Mr. William J. Barker, for thirty years connected with the electric and gas industry of Denver, has been elected vice-president and general manager of the Denver Gas & Electric Light Company.

Mr. Frank W. Frueauff, for several years vice-president of the Denver (Col.) Gas & Electric Light Company and its predecessor, the Denver Gas & Electric Company, has been elected president, vice Mr. Henry L. Doherty, who assumes the newly created office of chairman of the board.

Mr. John W. Cooke, New England engineer for the Electric Storage Battery Company, delivered a lecture on Nov. 20 to the students of the department of industrial electricity at Franklin Union, Boston, Mass. Mr. Cooke showed by several experiments the fundamental principles of the lead cell and illustrated its manufacture, installation and uses by well-chosen lantern slides.

Mr. Leroy J. Hannah has resigned the position of superintendent of the new-business division of the Louisville (Ky.) Gas & Electric Company to engage in other work. Mr. Hannah was formerly in charge of the new-business section of the Kentucky Electric Company, and when that company was absorbed in the existing united enterprise of the Louisville Gas & Electric Company he was appointed to the place now relinquished by him.

Mr. Jesse Scribner, of Chicago, district manager of the lighting department of the General Electric Company, has been bereaved by the death of his wife. Mrs. Scribner died on Nov. 24 in the German Hospital and the funeral took place from the family residence in Wilmette, Ill., the next day. Mr. Scribner has been connected with the Chicago office of the General Electric Company and its predecessor, the Thomson-Houston Electric Company, since 1889. Few electrical men in Chicago are better known and better liked than he. Mrs. Scribner also was well known to the wives of many of the electrical men in the Chicago district.

Mr. Albert H. Stanley, formerly general manager Public Service Railway, Newark, N. J., and now managing director London Underground Railway and other traction and omnibus interests in London, is visiting the United States in company with the following officers of the Midland Railway: Sir Guy Granet, general manager; Mr. F. Tatlow, assistant general manager, and Messrs. J. Sayers and J. Dalziel, electrical engineers. The party has planned to make an extensive tour of the United States for the purpose of studying all important steam railroad electrification and other operating practices preliminary to the proposed electrification of the Midland Railway in London and vicinity. The party is making its headquarters at the Ritz-Carlton Hotel, New York, and expects to be here until the new year.

Mr. T. C. Martin, secretary of the National Electric Light Association, has just returned from England and the Continent, after a vacation of some six weeks, part of which was devoted to looking into central-station conditions, particularly with regard to the methods in vogue for securing a larger utilization of electrical service. A great deal of interest was shown everywhere in the work of the association, which has recently created a foreign membership and now has members in all parts of the world. Before leaving London Mr. Martin met at luncheon a number of the leading central-station managers operating in that city and spent some hours with them in an interchange of views and data. He expresses himself as impressed with the general prosperity of the industry abroad, often under conditions that companies here would find burdensome or intolerable.

Mr. Hugh H. Harrison, of New York City, has been elected president of the Merchants' Heat & Light Company of Indianapolis, Ind. Mr. Harrison is well known financially, being vice-president of the Ann Arbor Railroad, a director of the Empire Trust Company of New York and a director of the Colorado Power Company, one of the largest corporations of its kind in the West. He is also largely interested in a number of other enterprises and has for the

last fourteen years been engaged in organizing and financing companies of this character. He is interested in street railway companies in New Jersey, and it was largely through his efforts that the Imperial Electric Light Company of St. Louis, the Scranton Electric Light Company of New Jersey and the Lackawanna Electric Light Company and the Baltimore Electric Light Company were organized and financed.

Mr. J. E. Latta, for two years an associate editor on the *Electrical Review and Western Electrician*, has severed his connection with that publication and joined the staff of the Underwriters' Laboratories as special agent. Mr. Latta is a graduate of the University of North Carolina and of the Graduate School of Harvard University. At both these institutions he specialized in mathematics, physics and electrical engineering. He studied engineering for a time at the Polytechnic Institute of Brooklyn, at Stevens Institute of Technology and in the shops of the Westinghouse Electric & Manufacturing Company and of the Hoover-Owens-Rentschler Company, at Hamilton, Ohio. In 1902 he was elected general manager of the Durham (N. C.) Traction Company, but declined the position in order to become associate professor of physics in the University of North Carolina. Mr. Latta was acting head of the department of physics and applied electricity for a year and a half, at the end of which period he was appointed professor of electrical engineering. He served in that capacity until 1909, when he left the university to enter the employ of the General Electric Company at Harrison, N. J., where for seven months he had charge of the course in applied electricity and illuminating engineering given to employees of the company. Leaving that position, he was engaged in electric power plant construction and operation in the Southwest, until the summer of 1911, when he became technical editor of *Electrocraft*, then published in Detroit, Mich. When that journal was purchased by the *Electrical Review and Western Electrician* he accepted a place on the editorial staff of the latter publication. Here his attention has been confined largely to the sections of this publication devoted to electrical contracting and electrical inspection. Mr. Latta assumed his new duties Dec. 1 and will make Chicago his headquarters.

Obituary

Alfred H. Pease, president of the Hart & Hegeman Manufacturing Company, Hartford, Conn., died suddenly on Nov. 27. As was his custom for many years, Mr. Pease ate his Thanksgiving dinner with his family and relatives at the Hartford Club. That evening he was seized with severe pains and died of heart failure in twenty minutes. Mr. Pease was born in Hartford forty-nine years ago, and after graduation from the high school in 1882 he entered the employ of W. F. Pelton & Company, wholesale dry-goods merchants. He left the dry-goods firm to enter the employ of the Hart & Hegeman Manufacturing Company as treasurer in 1892 and within a few years was made president of the company. During his presidency a large factory of the company on Capital Avenue with its improved grounds was built and an extensive and lucrative business secured. Mr. Pease was one of Hartford's best known business men, and his sudden death was a great shock to a wide circle of friends, who were deeply attached to him. He is survived by his widow, two sons and two daughters. Mr. Pease was a member of the Electrical Manufacturers' Club, of which he was at one time vice-president, the Hartford Club, the Hartford Golf Club, and the Farmington County Club.

ALFRED H. PEASE

C. E. Delafield, district manager of the Intermountain territory of the Crocker-Wheeler Company, died on Nov. 30 in Denver, Col. Mr. Delafield was associated for a number of years with the Wagner Electric Manufacturing Company, of St. Louis, Mo., and was later sales manager of the Ohio Brass Company of Mansfield, Ohio. He entered the service of the Crocker-Wheeler Company on Sept. 1, 1909, and had recently filled the position of district manager of that company's Intermountain territory, with headquarters at Denver and Salt Lake City.

J. C. Calisch, special agent of the railway department of the General Electric Company, died in New York on Nov. 28. Mr. Calisch was graduated from Stevens Institute in 1887 and served his apprenticeship with the Electric Storage Battery Company in Philadelphia. In 1890 he entered the New York office of Edison General Electric Company and remained with this company when it was merged with the General Electric Company in 1892. In 1895 Mr. Calisch was appointed manager of the Pittsburgh office, and in 1899 manager of the Buffalo office. In 1906 he resigned to become vice-president and general manager of the Buffalo & Lake Erie Traction Company. In 1912 he resigned from this company to return to the General Electric Company in the capacity of special agent in its railway department. Mr. Calisch was forty-six years old.

Henry M. Richards, chairman of the executive committee of the board of trustees of the Washington Water Power Company, Spokane, Wash., and vice-president of the Spokane & Eastern Trust Company, who was hurt in a runaway accident Nov. 9, at Springdale, Wash., died at the Springdale Hospital on Nov. 16. Henry M. Richards was born March 6, 1849, in New York. He was educated at Mount Washington Collegiate Institute at New York City and at an early age became a clerk with John P. Moore's Sons, importers and manufacturers of firearms, etc., later a salesman, and then a member of the firm. He remained actively with that firm from 1863 to 1886, when he retired from business in New York and removed to Warren, Ohio. There he remained until 1893, when he removed to Spokane, Wash., where he, with his brother, Mr. J. P. M. Richards, organized the Spokane & Eastern Trust Company. He became its vice-president, and shortly afterward he also became president of the Washington Water Power Company, which position he held from 1895 until 1910, when he became chairman of the executive committee of its board, the position he held at the time of his death. The phenomenal success of the Washington Water Power Company is largely due to the efforts of Mr. Richards. During the troublesome times following the panic of 1893 he succeeded in turning the tide of adversity by interesting Eastern capital. He became connected with the company first in 1894 as a trustee. He was elected president shortly afterward, and more than any other man was individually responsible for the friendly reorganization of the company's financial affairs, whereby the investors in the various securities of the company were saved from loss and the various sub-companies of the Washington Water Power Company were united into a concrete whole. When Mr. Richards became president of the company it had a capital of $1,500,000, and its bonded indebtedness was $1,637,000. To-day the capitalization is $15,000,000, and a five-million-dollar increase was announced only last week. The bonded indebtedness is now $5,000,000. In 1893 the street-railway system of the company operated thirteen cars; to-day it operates 120. It had then about 250 employees, to-day about 1200. Its gross revenues have grown from $200,000 to $3,000,000. During Mr. Richards' administration the greater part of all the power at Spokane has been developed, all of that at Post Falls, Idaho, and Little Falls, Wash., and the big work undertaken at Long Lake, Wash. When he became president the company was not operating outside of the limits of the city of Spokane, while to-day its lines extend nearly to the Montana line on the east and more than 100 miles to the west and south of Spokane.

HENRY M. RICHARDS

Construction

New England

CLAREMONT, N. H.—The Sunapee Lt. & Pwr. Co., of Sunapee, has been granted a franchise to furnish electricity in Claremont.

SHELBURNE, VT.—The Shelburne Improvement Society has entered into a contract with the Burlington Trac. Co., of Burlington, for installing a lighting system in the village. The contract provides for the installation of 30 street lamps. All the public buildings and many of the residences will be lighted by electricity.

VERGENNES, VT.—The Burlington Trac. Co., of Burlington, has acquired the property and holdings of the Vergennes El. Co. It is understood that the plant will be rebuilt and new equipment installed.

BROCKTON, MASS.—Work has just been started on an addition to the East Bridgewater plant of the Edison El. Ltg. Co. of Brockton. New equipment, including a 5000-kw turbine and two 600-hp boilers, 75-kw exciter, pumps, condenser and switching apparatus, will be installed. A. F. Nelson is manager.

CAMBRIDGE, MASS.—The Cambridge El. Lt. Co. expects to purchase within the next 30 days 109 ornamental poles and inverted tungsten lamps to be erected on Massachusetts Avenue. W. E. Holmes is treasurer and general manager.

SPRINGFIELD, MASS.—Bids will be received by the committee of the City Council on city property until Dec. 22 for electrical work, complete, in the addition to the Buckhaming School in accordance with plans and specifications prepared by B. Hammett Seabury, architect, 21 Besse Place, Springfield.

WAKEFIELD, MASS.—At a special election held recently it was voted to abandon the municipal electric plant for one year and to purchase electricity from the Reading municipal plant to operate the local system, the contract to take effect from Feb. 1, 1914. The town of Wakefield expects to purchase at once 12 iron lamp-posts for incandescent street lamps. S. I. Coles is manager of the municipal electric-light plant.

HARTFORD, CONN.—Bids will be received by the Board of Contract and Supply, City Hall, Hartford, Conn., until Dec. 16, for erecting 141 double-lamp posts and for furnishing all fixtures and lighting same with either gas or electricity for a term of years ending June 1, 1919. Plans may be seen and specifications may be obtained at the office of the Street Commissioners, City Hall. Joseph Buths is secretary of Board of Contract and Supply.

STAMFORD, CONN.—The Stamford Gas & El. Co. is now installing a 2500-kw Parsons turbine and Wheeler condenser and expects to have the same in operation by the holidays. G. B. Leland is superintendent.

Middle Atlantic

BALDWINSVILLE, N. Y.—The Oswego River Pwr. Co., of Syracuse, has awarded the contract for the construction of a transmission line from Phoenix to Mexico, a distance of 18 miles, to the Seneca Improvement Co., of Baldwinsville. The Oswego River company will furnish electricity to the Mexico El. Co. from its Phoenix station. The company also has franchises and has secured rights-of-way for the erection of a transmission line to Cato and Meridian; also for distributing systems in the above towns.

CENTER VILLAGE, N. Y.—The Public Service Commission, Second District, has granted the petition of the Afton-Windsor Lt., Ht. & Pwr. Co. to acquire all franchises, real estate and other privileges pertaining to the construction of a large hydroelectric power plant in Center Village and the erection of distributing systems in the villages and towns of Afton and Windsor and through the town of Colesville. The cost of the plant is estimated at $100,000. C. F. Wright and W. A. Bennett, of Susquehanna, Pa., are interested in the project.

COEYMANS, N. Y.—The Atlantic Lt. & Pwr. Co., of Coeymans, has recently purchased and is now installing a 225-hp Diesel engine, a 175-kw Crocker-Wheeler generator and a General Electric switchboard. J. N. Briggs is president.

GOWANDA, N. Y.—The Keyes El. Co., of Gowanda, has completed the construction of a new concrete dam to replace the portion of its dam damaged by the floods last March. The new section is about 200 ft. long, 16 ft. thick at the bottom and averages about 16 ft. in height. This makes about 300 linear ft. of solid concrete dam, with still 150 ft. of timber construction which will eventually be replaced by concrete. An item published Nov. 1 stated that the State Conservation Commission had approved plans and specifications of the company for the construction of a dam in Cattaraugus Creek. J. G. Keyes is secretary.

MIDDLETOWN, N. Y.—Within the next few months the Orange County Ltg. Co., of Middletown, expects to purchase an open-feed water heater and boiler-feed pump for boilers of 100-hp capacity. Laurent Heaton is manager.

NEW YORK, N. Y.—The contract for installing electric wiring, fixtures and gas piping at the City Hospital, Blackwell's Island, has been awarded to Lewis H. Woods, 2355 Jerome Avenue, New York, at $17,893.

OLEAN, N. Y.—The Board of Water Commissioners has entered into a contract with the Olean El. Lt. & Pwr. Co. to furnish electricity to operate the pumping plant in South Olean for a period of ten years. The cost of installing the pump and equipment is estimated at about $4,000.

RANDOLPH, N. Y.—The Randolph El. Lt. & Pwr. Co. has recently placed an order with the Ridgway Dynamo & Engine Co., of Ridgway, for an additional generating unit, consisting of a 150-kva, three-phase, 60-cycle, 2300-volt generator and one 200-hp high-speed automatic center-crank engine (16 in. by 16 in.). The company is also contemplating the purchase of a 6-ton ice plant before the opening of another season and would like to receive data and prices on machinery and equipment for same. Woodworth & Grace are proprietors.

ROCKVILLE CENTER, N. Y.—The Board of Trustees expects to purchase within the next year one engine, a boiler and a generator. H. C. Major is chief engineer.

SODUS, N. Y.—The Wayne Pwr. Co., of Sodus, expects to erect within the next 12 months a transmission line from Atlanta to Naples (11,000 volts, three-phase, 60 cycles); also to purchase material for a complete distribution system for Naples, including poles, wire, substation equipment, street-lamps, regulator and one tub transformer for street-lighting system, etc. G. R. Mills, of Sodus, is president.

TUPPER LAKE, N. Y.—The electric light committee expects to purchase Oct. 1, 1914, material for street-lighting system, consisting of tub-transformers, rectifiers, lamps, posts, etc.

WESTFIELD, N. Y.—Within the next six months the Board of Public Works expects to purchase a car load of poles for the municipal electric-light system; also within the next 18 months it expects to purchase a 200-kva, three-phase, 60-cycle, 2300-volt turbo-generator set or purchase energy generated at Niagara Falls. Harry Mettendorff is superintendent.

GROVE CITY, PA.—New equipment has recently been purchased for the municipal electric-light plant, including one 165-hp twin-cylinder Bessemer gas engine and one 100-kw, three-phase, 60-cycle, 2300-volt Western Electric generator and standard switchboard panel for control of above equipment. Paul J. Hays is superintendent.

LEWISTOWN, PA.—The Borough Council has granted the Raystown Lt. & Pwr. Co., of Huntingdon, a 75-year franchise to erect and maintain transmission lines in Lewistown.

STATE COLLEGE, PA.—Proposals will be received until Dec. 9 for the construction of a stock pavilion at State College, Pa., including heating, plumbing and electrical work. Plans and specifications may be seen at the offices of Edwin E. Sparks, president State College; Mitchell & Alter, Park Building, Pittsburgh; State superintendent of grounds and buildings, Capitol, Harrisburg, and Day & Klauder, architects, 925 Chestnut Street, Philadelphia.

IRVINGTON, N. J.—Bids will be received by the Board of Education, corner of West Clinton and Linden Avenues, Irvington, until Dec. 11, for furnishing material and constructing a ten-room school building to be located on the corner of Halstead Avenue and Nesbit Terrace, Irvington, in accordance with plans and specifications, which may be seen at the office of Joseph B. Allen, architect, 11 Sanford Avenue, Irvington. Separate bids must be submitted for the following work: Iron and steel work, masonry work, carpenter work, plumbing and gas-fitting, electrical work, vacuum-cleaning system and heating and ventilating. Bids will be received for a reinforced-concrete building as well as for a brick building. The cost of the building is estimated at about $76,000. Edward R. Folsom is chairman of new building committee.

PARKERSBURG, W. VA.—Arrangements are being made by the Parkersburg, Marietta & Interurban Ry. Co., of Parkersburg, for the installation of an ornamental street-lighting system, material for which has been purchased. The plans provide for the erection of 105 cast-iron standards, manufactured by the Morris Iron Co., each carrying four 60-watt lamps and one 100-watt lamp, to be maintained by underground wires, Orangeburg fiber conduit being used. The company will do the work. The cost of the system is estimated at $8,500. C. C. Gallaher is chief engineer.

ELKTON, VA.—The Town Council is asking for bids for equipment for an electric-light and power plant.

FREDERICKSBURG, VA.—Within the next two months the Rappahannock El. Lt. & Pwr. Co., of Fredericksburg, expects to erect 1 mile of two-phase four-wire transmission line. The company has been awarded a contract for lighting one of the prominent driveways in Fredericksburg. E. C. L. Ficklen is secretary and treasurer.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 9 for furnishing at the various navy yards and naval stations the following supplies: Port Royal, S. C., Schedule 6071—25 street-lamp brackets. Brooklyn, N. Y., Schedule 6077—24 portable, electric safety lanterns, 36 carbon packing rings; Schedule 6076—one electrically driven engraving machine. Bids will also be received at the same place until Dec. 30 as follows: Puget Sound, Wash., Schedule 6071—miscellaneous electric furnaces, etc.; Schedule 6082—two pipe-bending machines.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Dec. 13 for furnishing the following supplies under Proposal No. 685: (1) For 30,000 ft. 36-circ. mil, pothead wire, as per Specification 340-B; (2) 4000 ft. 40-circ. mil, rubber-covered fixture wire; (3) 75,000 ft. 40-circ. mil, inside

twisted-pair wire, as per Specification 340-B; (4) 10,000 ft. 64-circ. mil, rubber-covered and braided single wire, as per Specification 474-B; (5) 10,000 ft. one-pair, rubber-insulated, leaf-sheathed, galvanized flexible-steel armored cable (type 251), Greenfield type, Sprague Electric make, or equal, in accordance with Specification 546-C; (6) 1000 ft. 81-circ. mil, rubber-covered and braided copper wire, as per Specification 474-B; (7) 1000 ft. high-tension wire as per Specification 416-E. Major W. L. Clarke is disbursing officer.

North Central

ALBION, MICH.—The City Council has decided in favor of the single-post street-lighting system, but has postponed final action on awarding contract, awaiting further estimates of cost.

BIG RAPIDS, MICH.—The contract for the construction of the power house, 25 ft. by 69 ft., one story high, at the dam has been awarded to A. J. White and Roy S. Buck.

VASSAR, MICH.—The Electric Light Commission expects to purchase within the next 12 months electrical appliances and supplies, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies, etc. W. A. Peck is superintendent.

CAMBRIDGE, OHIO.—The car lines and electric plants in Cambridge and Guernsey County of the Midland Pwr. & Trac. Co., of Cambridge, will be taken over by the Ohio Service Co. as soon as the State Utilities Coommisson gives its consent. The purchase price is said to be $900,000. E. F. Pomerene is president of the Ohio Service Co.

CANTON, OHIO.—Electrical apparatus, it is reported, will be installed to double the motive power of the Knight Tire & Rubber Co.

CEDARVILLE, OHIO.—The Cedar Lt. & Pwr. Co. expects to purchase some arc lamps for street-lighting within the next 12 months. O. L. Smith is secretary.

CINCINNATI, OHIO.—Bids will be received at the office of the clerk of the Board of Education, City Hall, Cincinnati, until Dec. 29 for furnishing all material and labor, including carpenter work, structural-iron work, plumbing, painting, glazing, brickwork, concrete and cementing and electric work, to complete certain remodeling at Woodward High School, located at Sycamore and Woodward Streets, in accordance with plans and specifications on file in the office of C. W. Handman, business manager, 511 West Court Street, Cincinnati. Bidders may submit proposals for any or all the above items.

CLEVELAND, OHIO.—Plans are being considered by Mayor Baker and his cabinet for the immediate completion of the $2,000,000 municipal electric-lighting plant. About $300,000 will be required to complete the plant.

CLEVELAND, OHIO.—Bids will be received at the office of W. H. Kirby, secretary to the director of public service, Room 204, City Hall, Cleveland, Ohio, until Dec. 10 for furnishing, lighting, extinguishing, repairing, maintaining and furnishing electricity for electric lamps in the city of Cleveland for the year beginning Jan. 1, 1914. W. J. Springborn is director of public service.

DENNISON, OHIO.—The County El. Co., of Dennison, expects to purchase within the next two weeks 45 60-cp tungsten street series lamp fixtures for pole attachment. H. O. Stilgenbauer is superintendent.

GREEN SPRING, OHIO.—Within the next six months the Green Spring El. Lt. & Pwr. Co. expects to erect a concrete block or brick power house to replace the present building, which was badly damaged by fire recently; also it expects to purchase within the next two months fifty 5-amp direct-current meters. The company expects within the next month to take the agency of a guaranteed, reasonably priced vacuum cleaner and of an electric washing machine. D. M. Scott is manager.

GREENVILLE, OHIO.—Within the next three months the Greenville El. Lt. & Pwr. Co. expects to erect 13 miles of 33,000-volt transmission lines with full equipment; also to purchase within the next five months one 300-hp water-tube boiler, and within the next eight months coal-dumping apparatus for unloading coal from hopper cars. D. L. Gaskill is president.

KALIDA, OHIO.—The local electric-light plant is being remodeled and the voltage changed, which will require rewiring and remodeling a number of residences and business houses, together with considerable new work. The owners of the plant contemplate the purchase of considerable material, including electric-lamp fixtures, and would like to receive catalogs and prices on same; also estimates of cost at once on BX and BXL cable and metallic molding with all fittings. For further information address Joseph A. Murray, Kalida, Ohio.

MANSFIELD, OHIO.—The City Council has engaged H. Whitford Jones, of Cleveland, Ohio, to prepare plans and estimates for a municipal electric street-lighting plant. The plans will also provide for furnishing electricity for commercial purposes.

MARION, OHIO.—The Marion Ry., Lt. & Pwr. Co. has applied to the County Commissioners for permission to erect a transmission line to the stone quarry of the Marion Ohio Stone Co., northeast of the city. The cost of the line is estimated at about $2,000.

MOUNT BLANCHARD, OHIO.—Plans are being prepared by the Bert L. Marvin Co. for the erection of a power plant in Mount Blanchard, for which a franchise was recently granted. The proposed equipment will include gas engines and alternating-current generators (2300 volts, 60 cycles). Contracts for the above work will be awarded as soon as possible. The company has franchises pending in nearby towns, including Wharton and Vanlue, Ohio. An engineer has not yet been engaged.

NORWOOD, OHIO.—Most of the machinery in the municipal electric power plant damaged by the fire recently has been repaired and put into operation. Early in 1914 a bond issue of $104,000 will be available for betterment and improvements to the plant, which was provided before the fire. H. C. Hubbell is general manager of the water and light plants.

ORRVILLE, OHIO.—The Board of Public Affairs has engaged Frank B. Rae, consulting engineer, of Cleveland, to prepare plans and specifications for the installation of a municipal electric-light plant in Orrville.

SALEM, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 7, 1914, for construction, complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Salem, Ohio. Drawings and specifications may be obtained at the above office or from the custodian of site at Salem. O. Wenderoth is supervising architect.

ZANESVILLE, OHIO.—The City Council has passed the ordinance granting the Ohio El. Ry. Co. an extension of its franchise for ten years, under the terms of which the company is to reduce the price of electricity for lamps, to install a new street-lighting system on Main Street and to light the Y Bridge.

PADUCAH, KY.—The Electric Light Commission expects to purchase within the next four months one arc machine (50 lamps, 4-amp) and 25 4-amp arc-lamps. G. O. Keebler is superintendent.

STANFORD, KY.—Within the next six months the Stanford Wtr., Lt. & Ice Co. expects to purchase two new boilers of 200 hp. and one pump. B. F. Rout is manager.

BICKNELL, IND.—The capital stock of the Bicknell Lt. & Pwr. Co. has been increased from $10,000 to $60,000.

DANVILLE, IND.—Bids will be received by the Board of Commissioners of Hendricks County, Danville, Ind., until Dec. 19 for wooden furniture, steel furniture, decorating, electric fixtures, elevators, clock and floor covering for the new court house in Danville. Plans and specifications are on file in the office of Lewis W. Borders, county auditor.

RENSSELAER, IND.—The managers of the municipal water and electric-light plant expect to install at once one Chandler & Taylor automatic engine and American Well Works centrifugal pump with General Electric motor (directly connected) having a capacity of 500 gal per minute. Orders have already been placed for equipment. C. S. Chamberlain is superintendent.

ROYAL CENTER, IND.—The Royal El. Lt. Co., of Royal Center, expects to purchase within the next 12 months a few arc and incandescent lamps and wiring supplies. W. H. Bingaman is secretary.

SOUTH BEND, IND.—The City Council has adopted a resolution to engage a consulting engineer to report on the cost of installing a municipal electric-light plant in South Bend.

ALTON, ILL.—The City Council has granted an extension of one year's time to the Pisa Lt. & Pwr. Co. to establish a commercial lighting system in this city.

DOWNERS GROVE, ILL.—Bids will be received at the office of the village clerk until Dec. 15 for equipment for power plant, including two 100-hp, four-cycle engines, to be operated on crude and the lower grades of fuel oil; two 100-kva, three-phase, 60-cycle, 2300-volt, engine-type generators; one three-panel switchboard, two motor-driven centrifugal pumps, directly connected (300 gal. capacity), and two deep-well, motor-driven power heads. Specifications may be obtained upon application to Bert. C. White, village clerk, or W. H. Blodgett, village collector, Downers Grove.

JACKSONVILLE, ILL.—The City Council has called an election to be held Dec. 20 to submit to the voters the proposal to issue bonds to install a municipal electric plant to furnish electricity for lighting the streets of the city and also for commercial and residential lighting.

MACOMB, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 27 for construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Macomb, Ill. Drawings and specifications may be obtained from the above office or from the custodian of site at Macomb. O. Wenderoth is supervising architect.

MOUNT CARROLL, ILL.—The Mount Carroll El. Lt. Co. expects to purchase some transformers, meters, lightning arresters and wire for distribution system; also house-wiring supplies. J. W. Webb is superintendent.

FLORENCE, WIS.—The Electric Light Commission expects to purchase within the next 12 months electrically operated pumps for domestic and fire purposes (direct-pressure system) and material for new street-lighting system. E. E. Wilcox is president.

MANITOWOC, WIS.—The State Railroad Commission has placed the valuation of the properties of the Manitowoc El. Lt. Co. at $137,500. In addition the city must pay for the material on hand and improvements made to the plant since Jan. 1, 1913. The appraisal was made at the request of the city.

MONTICELLO, WIS.—The Monticello Granite Co., owner of the local electric-light plant, has entirely rebuilt its distribution lines within the last two years. Richard Gessner is manager and electrician.

ADA, MINN.—Within the next four months the managers of the municipal electric-light plant expect to purchase wiring supplies, etc. O. Sandsold is superintendent.

MINNEAPOLIS, MINN.—Bids will be received by Henry N. Knott, city clerk, until Dec. 12, for lighting the city with both electricity and gas.

ORTONVILLE, MINN.—The Board of Public Works expects to erect within the next 12 months 2 miles of transmission line for two-phase, three-wire, 2300-volt system; also to purchase one two-phase, 2300-volt generator and engine to drive same of 150 hp, either tandem compound or four-valve, and exciter for above unit; about 25 35-ft. poles, transformers of about 25 kva, one oil switch (2300 volts), four two-phase meters, 8000 ft. No. 10 wire, 8000 ft. No. 6 wire, 6000 ft. No. 8 wire and 200 60-watt incandescent street lamps. A. H. Meyer is superintendent.

PIPESTONE, MINN.—Within the next four months the Pipestone El. Lt., Ht. & Pwr. Co. will install a 125-kva, 2200-volt generator to be directly connected to a Fitchburg engine already installed; also to purchase within the next three months 20 standards for ornamental five-lamp clusters. J. W. Campbell, Jr., is manager.

STARBUCK, MINN.—The Board of Water and Light Commissioners expects to purchase within the next three months lightning arresters, wire, meters and time switches; also within the next two months to purchase electrical appliances, including heating and cooking apparatus, vacuum cleaners, washing machines, irons, etc. Early next year the system will be changed from direct-current to alternating-current and a 24-hour service established by Feb. 1, 1914. Electricity for operating the plant will be purchased from the Glenwood Lt. & Pwr. Co., of Glenwood. The local plant will be held for use in case of emergency. A. H. Dreyer is manager.

WELLS, MINN.—The Wells Water, Light, Power and Building Commission may possibly purchase material for an ornamental street-lighting system within the next 12 months. J. A. Culshaw is secretary and superintendent.

WESTBROOK, MINN.—The installation of an electric-light plant in Westbrook is under consideration. The Commercial Club is interested.

WORTHINGTON, MINN.—Within the next 30 days the Board of Light and Water Commissioners expects to erect 2 miles of two-phase, 60-cycle, 2300-volt transmission line and within the next 12 months to purchase one 250-hp generating unit complete, one switchboard panel and quite a large quantity of material for distribution system, including transformers, poles, transmission towers, lightning arresters, insulators, distribution cable, wire, meters, etc.; also expects to purchase soon a coal and ash-handling system. W. H. Buchan is city clerk.

FOREST CITY, IA.—The Forest City El. Lt. & Pwr. Co. is erecting a new power house and has purchased one 125-kva generator, one 14-in. by 36-in. Corliss engine and a new boiler. A steam separator will be needed for engine, which has not yet been purchased. Within the next 10 months the company expects to purchase transformers, lightning arresters, wire and meters. Frank Kellogg is manager.

GLIDDEN, IA.—The town of Glidden has purchased and expects to install within the next 30 days one 100-kva alternator and four-valve engine (directly connected), and one switchboard panel for above in the municipal electric-light plant. Samuel C. Johnston is manager.

MASON CITY, IA.—The central station of the People's Gas & El. Co., of Mason City, is being entirely rebuilt (the output being more than doubled), including the installation of 1000 hp in boilers and a 2000-kw steam turbine. The reconstruction work is being carried out under the supervision of B. J. Denman, assistant general manager of the United Lt. & Rys. Co., of Davenport, Ia. M. Anderson is general manager of the People's Gas & El. Co.

MUSCATINE, IA.—The City Council has engaged Prof. J. B. Hill, of Iowa City, to investigate the feasibility of establishing a municipal electric-light plant in Muscatine.

OTTUMWA, IA.—The Water Works trustees have submitted a report to the City Council recommending an issue of $125,000 in bonds for the construction of a concrete dam across Des Moines River to develop power to generate electricity for lighting the streets and parks of the city. It is estimated that 475 hp can be developed.

WAPELLO, IA.—The Burlington Ry. & Lt. Co., of Burlington, has been granted a 25-year franchise to install and operate an electric-light system in Wapello. Under the new franchise the company must install a new street-lighting system and establish a 24-hour service within 90 days.

WASHINGTON, IA.—Within the next three months the Iowa Gas & El. Co., of Washington, expects to purchase a carload of poles; also meters and transformers, electrical appliances and supplies as needed. H. F. Darbyshire is manager.

CAPE GIRARDEAU, MO.—Franchises granted the Missouri Public Utilities Co. by the City Council for water, light and power service and a contract between the city and the company for public water service for lighting the city were ratified by the voters at an election held recently. Under the new franchises the company will have to make improvements and extensions to its plant involving an expenditure of $100,000 within the next six months. The company will purchase the street railway and build an interurban railway to several outlying towns.

JEFFERSON, MO.—The Public Service Commission has granted the Jefferson City Lt., Ht. & Pwr. Co. permission to purchase the property of the Jefferson City Bridge & Transit Co. A formal order will be issued by the commission granting the purchasing company permission to issue $1,000,000 in bonds for improvements and extensions. The present plans provide for the development of a system of electric railways in the central part of the State, to be followed by an electric trunk line connecting St. Louis and Kansas City. Lawson S. Price is president of the Bridge & Transit Co.

KING CITY, MO.—The King City El. & Mfg. Co. expects to purchase within the next 30 days a 30-kw or 37½-kw, three-phase, 60-cycle, 2300-volt generator, 3-kw exciter and tungsten lamps. Harry V. Forest is secretary and manager.

MARSHALL, MO.—The proposal to issue $70,000 in bonds for a municipal electric-light plant was defeated by nine votes, two-thirds being necessary. It is expected that another election will be called at an early date.

OZARK, MO.—The Wtr. Pr. Lt. Co., of Ozark, expects to purchase within the next six months one 100-hp, 25-cycle, 2200-volt, slow-speed motor and possibly a 75-kw, 60-cycle, 2300-volt generator. S. E. Bronson is manager.

PARIS, MO.—The town of Paris expects to purchase within the next six to 12 months two 56-in. by 16-ft. return tubular boilers for the municipal electric-light plant; also probably another direct-connected generating unit of from 75 kw to 100 kw. George C. Blakey is superintendent.

PLATTE CITY, MO.—The Platte City El. Lt. & Pwr. Co. expects to erect within the next three months one 5-ton ice machine, belt-driven, with 40 tons storage capacity; also to purchase one 60-hp boiler complete. Smith Clemmings is proprietor and manager.

RUGBY, N. D.—The Northern Tel. Co., of Minot, expects to overhaul its distribution system in Rugby this winter. C. H. Coas, of Minot, is general superintendent.

HOWARD, S. D.—The Miner County Milling & Ltg. Co., of Howard, expects soon to erect an addition to its power house to provide space for a new engine and generator soon to be purchased. The company may also purchase a condenser, depending upon the type of engine purchased. C. A. Laurson is manager.

LENNOX, S. D.—The City Council has granted H. B. Fairland and T. K. Coles a franchise to construct and operate an electric-light plant in Lennox for a period of 20 years.

PIERCE, NEB.—Within the next 30 days the Pierce Milling Co. expects to erect a new 150-kva, 60-cycle generator, replacing the 133-cycle generator now in use. This generator will be driven by water-power and a 100-hp (type T. H.) La Vergne oil engine already installed. The new flour mill of the company will be driven by electricity, and a day service will be established in this city. F. Rainbow is manager.

UNIVERSITY PLACE, NEB.—Within the next six months the Electric Light and Water Commissioners expect to purchase one deep-well pump (having a capacity of 150 gal. per minute) for the water department, one carload of poles and underground conduit, and several lamp-posts for curb street lighting. F. Harbican is manager.

ATCHISON, KAN.—The McKinley Syndicate, it is reported, is contemplating the construction of a large power plant in Atchison within the next year, to cost about $250,000. Options, it is said, have been taken on several sites. It is proposed to install a power plant to furnish electricity for Atchison, Topeka, Leavenworth and other nearby towns. H. E. Chubbuck, of Peoria, Ill., is general manager.

CLAY CENTER, KAN.—The city of Clay Center expects to install a 250-hp open-feed water heater in the municipal electric-light plant within the next two months. C. F. Rasmussen is superintendent.

LYNDON, KAN.—Within the next two months the Osage County Lt. & Pwr. Co. will erect 10 miles of single-phase, 6600-volt transmission line. T. L. Hussey, of Lyndon, is secretary.

LYNDON, KAN.—The Electric Light Commission expects to purchase within the next two months one oil switch, one circuit-breaker, one voltmeter, one ammeter (2200 volts, single-phase), one 20-kw meter and one switchboard panel (24 in. by 54 in.). Roy W. Wright is superintendent.

NEODESHA, KAN.—The managers of the municipal electric-light plant and water-works system expect to purchase on Jan. 5 one 200-kw, three-phase, 60-cycle, 2300-volt engine-type alternator, with exciter and engine, and one switchboard panel for above generator. Charles M. Kimball is superintendent.

PRATT, KAN.—The Pratt Ice & Lt. Co. is contemplating extending its transmission lines to adjoining towns and to the farming districts surrounding Pratt. If the lines are extended, it will be necessary to enlarge the plant to furnish the additional service.

Southern States

CLINTON, N. C.—Within the next 12 months the Sampson Pwr. Co., of Clinton, expects to purchase an engine and generator and auxiliaries, including transformers, poles, meters, incandescent lamps, etc.; also some cooking apparatus, vacuum cleaners, etc. G. E. Petty is secretary and treasurer.

GREENVILLE, N. C.—Within the next six months the Water and Light Commission expects to install one 500-kw steam turbine or engine (directly connected), with exciter and condenser; also to purchase two

250-hp water-tube boilers, 175-lb. working pressure; one three-stage pump, having a capacity of 1000 gal. per minute, directly connected to a three-phase, 2300-volt motor. H. L. Allen is superintendent.

STATESVILLE, N. C.—The City Electric Light and Power Department expects to erect, within the next six months, about 2 miles of three-phase, 2300-volt transmission line. J. D. Cochrane is superintendent.

ATLANTA, GA.—Bids will be received by the Commissioners of Fulton County, Fulton County Court House, Atlanta, until Jan. 20, 1914 (extension of date from Dec. 20, 1913), for furnishing steel filing devices and equipment, wood furniture and lighting fixtures with lamps for installation. Plans and specifications and other information may be obtained at the office of A. Ten Eyck Brown and Morgan & Dillon, Forsyth Building, Atlanta, Ga., upon a deposit of $20 for each item. H. M. Wood is clerk.

LAWRENCEVILLE, GA.—The city of Lawrenceville has contracted with the J. B. McCrary Co., of Atlanta, to furnish electricity from a large hydroelectric power plant in Anniston, Ga. The work will include the construction of dam, power house, installation of waterwheels and generator, and switchboard; also the erection of a transmission line 30 miles long, passing through the towns of Logansville, Grayson and Snellville. Edward Tarpley is superintendent.

McDONOUGH, GA.—Within the next six months J. G. Smith, owner of the local electric-light plant, contemplates the erection of 1 mile of distribution line and installing electrically driven pumps for water-supply service. Mr. Smith is installing a new street-lightng system, consisting of 44 series tungsten lamps.

SAVANNAH, GA.—Plans are being prepared by local architects for remodeling a three-story building at 110-112 State Street West for a power plant and office building for the Savannah Ltg. Co.

TALLAHASSEE, FLA.—The Board of Public Works is extending the distribution lines of the municipal electric-light plant to parts of the city now without electrical service. D. R. Swing is superintendent.

WINTER GARDEN, FLA.—The Winter Garden Lt. & Wtr. Co. is now erecting a three-phase transmission line connecting with the town of Ocoee (2½ miles long) for the purpose of furnishing electricity for lamps and motors. M. L. Calvin is secretary and treasurer.

ZOLFO, FLA.—A committee has been appointed by the Zolfo Board of Trade to investigate the feasibility of installing an electric-lighting system in Zolfo. The committee will ask the Wauchula Mfg. Co. to submit an estimate on extending a transmission line here to furnish electrical service in this town.

OPELIKA, ALA.—The managers of the municipal electric-light plant have recently purchased one 225-hp Ball engine and one 150-kw Fort Wayne (Wood system), generator. Charles Shaefer is superintendent.

TUPELO, MISS.—The city of Tupelo expects to purchase within the next six months one new boiler. E. R. Chisholm is superintendent.

ARKADELPHIA, ARK.—The property of the Arkadelphia El. Lt. and Wtr. Companies has been purchased by H. C. Couch, of Little Rock, and associates. The new owners, it is understood, will expend from $10,000 to $15,000 for improvements to the water and light systems.

RUSSELLVILLE, ARK.—The Russellville Wtr. & Lt. Co. expects to erect within the next 12 months steel towers to carry transmission lines across the Arkansas River (span 200 ft.); also to purchase within the next six months a 350-kw to 400-kw, three-phase, 2300-volt generator directly connected to engine. Arthur E. Hecker is manager.

WOMBLE, ARK.—The town of Womble is contemplating the installation of a water-works system, the water to be secured from Caddo River. The development of the water-power of Caddo River is under consideration and an electric-lighting system may be installed.

CROWLEY, LA.—The City Council, it is reported, has ordered a 300-hp engine and a 200-kw generator (to cost about $18,500) for the municipal electric-light plant. Other improvements to the plant are under consideration.

NATCHITOCHES, LA.—Within the next 12 months the managers of the municipal electric-light plant expect to purchase one 50-kw generator directly connected to steam engine, 50 hp in motors and appliances for line. Walter E. Aymond is superintendent.

BARTLESVILLE, OKLA.—The Bartlesville Gas, El. & Ry. Co. expects to erect within the next 30 days a 2300-volt transmission line from Bartlesville to Dewey, a distance of 4½ miles. L. G. Coleman is general manager.

GRANDFIELD, OKLA.—The Southern Oklahoma Lt. & Pwr. Co., of Grandfield, is installing an electric-light plant to furnish electrical service here. The equipment will include one 40-hp Muncie crude-oil engine and one 30-kw, three-phase, 60-cycle Western Electric generator and switchboard. The street-lighting system will consist of 47 tungsten lamps. The company is doing the work. Lee E. Edwards is engineer and J. A. Brabham general manager.

BROWNWOOD, TEX.—Plans are being considered for the installation of a large power plant in Brownwood. The company contemplates the erection of a number of arc lamps.

FARMERSVILLE, TEX.—The Farmersville Mill & Lt. Co. has recently purchased and is now installing new boilers, an engine and a 60-cycle generator. When the installation is completed the old equipment will be discarded. J. B. Honoker is superintendent.

MISSION, TEX.—The city of Mission would like to receive from reliable parties or firms proposals for the installation of an electric-light plant and water-works system in the city, for which a liberal franchise will be given. For further information address S. A. Pipes, secretary and treasurer of Chamber of Commerce.

TERRELL, TEX.—The city of Terrell has recently purchased two switchboard panels, voltage regulators, tub transformer and 36 cast-iron posts for street lamps. E. V. Miller is city secretary and Samuel Krebs is superintendent.

Pacific States

SPOKANE, WASH.—The contract for installing an ornamental lighting system on Riverside Avenue has been awarded to the Washington Wtr. Pwr. Co., at $25,500. C. M. Fassett is commissioner of public utilities.

TACOMA, WASH.—E. F. Gregory and others, of Tacoma, are contemplating the construction of an electric-power plant on Clover Creek for the purpose of furnishing electricity to a truck-gardening district about half a mile from the city limits. Application has been made to the Commissioners of Pierce County for a franchise to erect a transmission line to the colony.

CLATSOP, ORE.—The City Council has granted the Seaside Pwr. & Lt. Co., of Seaside, a franchise to extend its transmission lines into this city to furnish electrical service here. Post office address, Seaside, R. F. D. Gearhart.

DURHAM, CAL.—The Durham Lt. & Pwr. Co. expects to purchase within the 12 months transformers, 2200/110/220 volt, 6600/110/220 volt, 100 poles and No. 6 copper wire; also flatirons, toasters, etc. J. A. Foster is manager.

FRESNO, CAL.—Estimates are being prepared for the Board of Trustees of the cost of installing ornamental lamps on Tulare, K, Merced and other streets in Fresno.

LOS ANGELES, CAL.—The City Council has authorized the city engineer to prepare plans for an ornamental lighting-system on Wilshire Boulevard, from Parkview to the west city limits.

RIVERSIDE, CAL.—The Nevada-California Pwr. Co., First National Bank Building, Riverside, expects to build within the next 12 months one 10,000-kva hydroelectric power plant, four substations, aggregating 4000 kva, 150 miles of 60,000-volt transmission line; also to purchase two 5000-kva, three-phase generators, two 6000-hp waterwheels, two 150-kw exciters, two waterwheel governors, two 87,000-volt lightning arresters, four 33,000-volt arresters, one six-panel switchboard and miscellaneous equipment; also four 3350-kva, 87,000/2200-volt step-up transformers, 4000 kva in 33,000/2200 transformers, 1000 kva in 2200/110/2200-volt transformers, miscellaneous sizes, six tub transformers with brackets, lamps, etc., for series incandescent systems. The company also expects to purchase within the next 12 months electrical appliances and supplies, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies, switches, etc., amounting to approximately $20,000. C. O. Poole is chief engineer.

SAN DIEGO, CAL.—Within the next three months the San Diego Consol. Gas & El. Co. expects to purchase a 4000-kw turbo-generator set with necessary boilers. H. H. Jones is manager.

SAN FRANCISCO, CAL.—Plans have been prepared by Frederick H. Meyer, Bankers' Investment Building, San Francisco, for foundation work for a large power house for the Pacific Gas & El. Co., to be erected on Commercial Street, west of Montgomery Street.

VISALIA, CAL.—An announcement, it is reported, has been made that the Mount Whitney Pwr. & El. Co. will expend $1,600,000 within the next 14 months on improvements and extensions to its service. Work on the Wolverton dam, located back of the giant forest and power plant No. 5, will be rushed to completion and extensive improvements will also be made to the Visalia steam generating plant. New substations are to be erected at Woodville, Terra Bella, Goshen, Strathmore and Elimart, and the stations at Delano and Exeter will be enlarged. John C. Hays, of Visalia, is president and general manager.

MALAD CITY, IDAHO.—The Evans Lt. Co., of Malad City, expects to erect within the next 12 months a new power house and a pipe line 10,000 ft. long and to purchase two generators, waterwheel, exciters, switches, waterwheel governors, transformers, poles, etc. J. H. Campbell is manager.

EPHRAIM, UTAH.—The Electric Light Commission expects to purchase within the next 12 months 50 meters and material for reinforcing 100 poles. J. H. Jensen is city electrician.

SALT LAKE CITY, UTAH.—The Board of Education has decided to install an electric generating plant at each district school building.

GRAND JUNCTION, COL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Jan. 6, 1914, for construction, complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Grand Junction. Drawings and specifications may be obtained at the above office or from the office of the custodian of site at Grand Junction. O. Wenderoth is supervising architect.

LAS CRUCES, N. M.—Within the next 10 months the Las Cruces El. Lt. & Ice Co. expects to purchase a boiler having a rating of about 200-hp. (considering vertical water-tube type). D. W. Morgan is manager.

Canada

EDMONTON, ALTA.—The installation of an electric-light plant at the University of Alberta, located in South Edmonton, is under consideration. Data for the proposed plant has already been secured.

VANCOUVER, B. C.—The Western Canada Pwr. Co., Ltd., of Vancouver, expects to erect within the next 18 months two 13,000-hp hydroelectric units at its Stave Falls plant, for which contracts have already been placed. Within the next 12 months the company expects only to purchase such apparatus as may be needed for ordinary extensions and connections to its distribution system. R. F. Hayward is general manager.

MONCTON, N. B.—The City Council has appointed a committee to investigate the proposal of installing an electric plant at the new pumping station to supply electricity for lighting the streets, civic buildings and operating the pumping station. The Moncton Tramways, El. & Gas. Co. now furnishes electrical service here.

NEW WATERFORD, N. S.—The Waterford Utilities, Ltd., recently organized, is installing a new electrical distribution system. Electricity for operating the system will be obtained from the Dominion Coal Co. at 6600 volts, 60 cycles, and will be stepped down to 2200/110 volts at the local substation. It is expected that a separate plant will be installed later.

BOLTON, ONT.—The Hydro-Electric Power Commission of Ontario has submitted an estimate of the cost of electricity delivered at Bolton to the Village Council. This is made on the assumption that Woodbridge will take 100 hp; on this assumption it is estimated that 250 hp can be delivered to Bolton at $43.60 per hp per year. This cost includes the transmission of energy and stepping it down to a voltage suitable for distribution within the village limits.

LAMBETH, ONT.—The Village Council is considering the question of entering into a contract with the Hydro-Electric Power Commission of Ontario for Niagara power for lighting the village.

LONDON, ONT.—Tenders are being called for a storage battery and charging equipment to be used in connection with a fire-alarm system.

TORONTO, ONT.—Tenders will be received by the chairman of the Board of Control, City Hall, Toronto, Ont., until Jan. 20, 1914, for the installation of a complete mechanical filtration plant, boilers, steam turbo-generator plant and all appurtenances at Toronto Island. Specifications and tender forms may be obtained upon application at the office of James Milne, mechanical and electrical engineer, Department of Works, City Hall, Toronto. H. C. Hocken, Mayor, chairman of Board of Control.

WINDSOR, ONT.—The City Council has recommended the extension the street-lighting system by about 200 lamps.

MONTREAL, QUE.—The Southern Canada Pwr. Co., it is understood, is preparing plans to go ahead with the hydroelectric development which was recently planned by the South Shore Pwr. & Paper Co. The water-power is located on the St. Francis River, near Drummondville, Que.

QUEBEC, QUE.—The Quebec Ry., Lt., Ht. & Pwr. Co. expects to erect within the next 12 months 20 miles of 40,000-volt transmission line; also to purchase transmission towers, lightning arresters, insulators and step-down transformers. Lewis Burren is chief electrical engineer.

SOUTH BOLTON, QUE.—M. Houldsworth is contemplating the installation of a small steam-driven electric plant in his mill and will require equipment for same.

KAMSACK, SASK.—The Town Council is reported to have leased the electric plant of J. Simmott and will extend the system. The Council recently passed a by-law authorizing an expenditure of $25,000 for a new plant, but as yet the debentures have not been disposed of.

Miscellaneous

CEBU, P. I.—Within the next year the Visayan El. Co., of Cebu, expects to erect a new power station (52 ft. by 85 ft.), and to purchase within the next six months a 300-kw generator, a compound condensing engine or turbine, two-phase, 60-cycle, 2300-volt; also to purchase within the next 12 months a 350-hp boiler. Albert Bryan is president and manager.

New Incorporations

NORWICH, CONN.—The Tunnel Pwr. Co. has been incorporated with a capital stock of $100,000 to take over certain power rights on the Quinebaug River. Charles W. Comstock, of Norwich, is president of the company.

ELLSWORTH, MAINE.—The Pocokiock Land & Wtr. Pwr. Co. has been incorporated with a capital stock of $99,000 to conduct lumbering operations and develop water-power in the township of Pocokiock. The officers are Rufus E. Hagerthy, president, and Dr. A. C. Hagerthy, secretary and treasurer, both of Ellsworth.

HARRISBURG, PA.—Charters have been granted by the State Department to H. H. Ganser, P. A. Wilson and W. G. Gaston, of Norristown, for four electric companies to operate in Frederick, Skippack, Perkiomen and Worcester Townships, each company taking the name of the township it operates in. Each company is capitalized at $5,000. A charter was also granted to Alvin C. Aldorfer, of Harleysville; John F. Lederachsville and D. M. Andros, of Fairview, for the Montgomery Lt. & Pwr. Co., of Skippack. The company is capitalized at $5,000.

Directory of Electrical Associations, Societies, Etc.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C. Annual meeting, Atlanta, Ga., Dec. 29.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio. Annual meeting, Atlanta, Ga., December, 1913.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y. Annual meeting, May, 1914.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark. Annual meeting, May, 1914.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago. Annual meeting, New Orleans, May 19-22, 1914.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary-treasurer, J. H. Larmonth, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

ELECTRIC CLUB OF CHICAGO. Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON. Secretary, R. S. Hale, 39 Boylston St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Blumenthal, 179 West Washington Street. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Peterman, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, Harvey Robinson, 124 West 42d Street, New York.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA, NEW ENGLAND SECTION. Secretary, L. L. Edgar, 39 Boylston St., Boston.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual meeting, May, 1914.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 81 New St., New York. Annual meeting, New York, January, 1914.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNAL-COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary, Dr. E. B. Rosa, Bureau of Standards, Washington, D. C. San Francisco, Sept. 13-18, 1915.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Catteli, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 6-11, 1915.

IOWA ELECTRICAL ASOCIATION. Affiliated with N. E. L. A. Secretary, H. B. Maynard, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia. Annual meeting, Cedar Rapids, April 23, 1914.

JOVIAN ORDER. Jupiter (president), W. N. Matthews, St. Louis, Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn. Annual meeting, Minneapolis, March, 1914.

MISSISSIPPI ELECTRIC ASSOCIATION (affiliated with the National Electric Light Association). Secretary-treasurer, Frank J. Duffy, Natchez, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis. Annual meeting, May, 1914.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York. Annual meeting, Philadelphia, May, 1914.

NATIONAL ELECTRIC LIGHT ASSOCIATION, COMMERCIAL SECTION. Secretary, J. F. Becker, 1170 Broadway, N. Y.

NATIONAL ELECTRIC LIGHT ASSOCIATION, EASTERN NEW YORK SECTION. Secretary, C. S. Van Dyck, Schenectady, N. Y.

NATIONAL ELECTRIC LIGHT ASSOCIATION, HYDROELECTRIC SECTION. Secretary, S. A. Sewall, 29 West 39th St., New York.

NATIONAL ELECTRIC LIGHT ASSOCIATION, MICHIGAN SECTION. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEBRASKA SECTION. Secretary-treasurer, S. J. Bell, David City, Neb.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEW ENGLAND SECTION. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NORTHWEST SECTION. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

NATIONAL ELECTRIC LIGHT ASSOCIATION, SOUTHEASTERN SECTION. Secretary-treasurer, A. A. Wilbur, Columbus, Ga. Annual meeting, Isle of Palms, Charleston, S. C., Aug. 19-21, 1914.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago. Annual meeting, June, 1914.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk Street, Boston, Mass. Open meeting, New York, March, 1915.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 598 Broadway, Albany, N. Y.

NEW YORK ELECTRICAL CREDIT ASSOCIATION (affiliated with the National Electrical Credit Association). Secretary, Franz Neilson, 80 Wall St., New York. Annual meeting, Dec. 9.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York. Annual meeting, New York, June, 1914.

NORTHWESTERN CEDARMEN'S ASSOCIATION. Secretary, N. E. Boucher, 743 Lumber Exchange, Minneapolis, Minn. Annual meeting, Jan. 6, 1914.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, F. C. Green, 291 East Morrison St., Portland, Ore. Annual meeting, April, 1914.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Bldg., Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Prof. H. H. Norris, Ithaca, N. Y. Annual meeting, Princeton, N. J., June, 1914.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Texas. Annual convention, Galveston, Tex., May 22-25, 1914.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, A. B. Marsden, Manchester, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill. Annual meeting, Cincinnati, Jan. 27-29.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, Stephenson Building, Milwaukee, Wis. Annual meeting, Jan. 15 and 16, 1914.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED NOV. 25, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,079,332. ALTERNATE-CURRENT MOTOR; V. A. Fynn, London, Eng. App. filed June 12, 1911. Induction shields prevent any inductive transfer of energy between the end windings of the primary and secondary members.

1,079,341. METHOD OF STARTING ELECTRIC-LIGHTING APPARATUS; P. C. Hewitt, New York, N. Y. App. filed March 23, 1901. Produces an arc springing from one of the electrodes and causes the arc to traverse or extend along a high-resistance conductor to the other electrode.

1,079,342. ELECTRIC, GAS OR VAPOR LAMP; P. C. Hewitt, New York, and N. W. Rogers, Mount Vernon, N. Y. App. filed March 23, 1901. The main arc is started from a supplementary arc.

1,079,343. ELECTRIC LIGHTING; P. C. Hewitt, Ringwood Manor, N. J. App. filed April 5, 1900. Plurality of vapor electric devices operated in parallel; inductance used for starting.

1,079,344. ELECTRICAL PRODUCTION OF LIGHT; P. C. Hewitt, Ringwood Manor, N. J. App. filed April 29, 1899. Excess of accumulated mercury is returned to the lower electrode through a return tube separate from the vapor path.

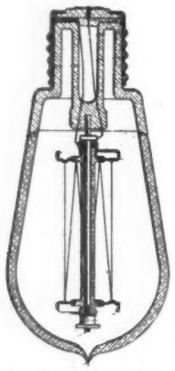
1,079,346. METHOD OF MAKING STORAGE-BATTERY ELECTRODES; H. C. Hubbell, Newark, N. J. App. filed Nov. 23, 1910. Electro-deposits nickel upon one side of a filament-shaped portion of nickel active material and masses together a plurality of the resulting filaments.

1,079,352. VACUUM-TIGHT SEAL; F. G. Keyes, Boston, Mass. App. filed March 6, 1913. Absorbing material embedded in a pulverulent material, interposed between the interior of the container and the metalic member.

1,079,377. METHOD OF PURIFYING AND STERILIZING LIQUID; G. W. Swinburne, East Orange, N. J. App. filed June 21, 1910. Frees chlorine and oxygen by electrolytic action.

1,079,379. OUTFIT FOR ALTERNATING-CURRENT VAPOR LAMPS; P. H. Thomas, Montclair, N. J. App. filed Sept. 27, 1905. Locates the ballast or other regulating device in the lead of one or more of the positive electrodes.

1,079,380. CIRCUIT INTERRUPTER; P. H. Thomas, Montclair, N. J. App. filed Dec. 24, 1906. Indentation in the cylindrical container divides the mercury into two parts upon rotation of the container about its axis.



1,079,804.—Filament Lamp.

1,079,386. MOTOR CONTROLLER; T. E. Barnum, Milwaukee, Wis. App. filed May 13, 1909. An adjustable member on the controller arm determines the contact point at which the controller arm will stop.

1,079,389. ELECTRIC-RAILWAY TRUCK; W. L. Boyer, Kingston, N. Y. App. filed Jan. 25, 1913. Motor frame or casing serves in part as the truck frame.

1,079,400. CAR-LIGHTING SYSTEM; W. Cooper, Pittsburgh, Pa. App. filed Sept. 10, 1909. Electric car provided with a booster set to maintain constant the energy in the lighting circuit.

1,079,401. CAR-LIGHTING SYSTEM; W. Cooper, Pittsburgh, Pa. App. filed Oct. 13, 1909. A single dynamo-electric machine operates the air compressor and supplies lighting current.

1,079,407. AUTOMATIC WEIGHING DEVICE; J. Grimes, Los Angeles, Cal. App. filed Jan. 9, 1913. Has electromagnetically controlled feed gate.

1,079,408. TROLLEY GUARD; M. Guariglia, Morgantown, W. Va. App. filed Feb. 3, 1913. Arms normally closing the open side of the guard are retracted by tapering bars.

1,079,410. CIRCUIT-BREAKER; P. C. Hewitt, New York, N. Y. App. filed May 1, 1908. Mercury-vapor type.

1,079,413. IGNITION APPARATUS FOR HYDROCARBON ENGINES; R. Huff, Detroit, Mich. App. filed Dec. 22, 1906. Transformers in the battery and generator circuits and means for simultaneously adjusting the spark-control contacts for both the battery and generator.

1,079,427. APPARATUS FOR ELECTROPLATING PIPES; D. H. Murphy, Pittsburgh, Pa. App. filed July 8, 1912. Pipes are positively rolled through the plating solution.

1,079,428. APPARATUS FOR ELECTROPLATING PIPES; G. H. Murphy, Pittsburgh, Pa. App. filed May 9, 1913. Inflated compressible tube contacts the pipes and rolls the same.

1,079,445. SUPPORT FOR CONDUIT CABLES; E. H. Smith, Cleveland, Ohio. App. filed Feb. 24, 1913. Wall bracket carrying insulating cable-supporting rollers.

1,079,451. AUTOMATIC CAR-STOPPING DEVICE; J. S. Strickland and C. H. Beach, Tacoma, Wash. App. filed June 26, 1909. Magnetically operated trip device in the circuit of the danger signal.

1,079,467. SEARCH-CALL APPARATUS; A. F. Boardman, Arlington, Mass. App. filed Sept. 26, 1912. For sending distinctive signals simultaneously to a plurality of different signal devices for the purpose of locating a person desired, as in a factory.

1,079,480. MOTOR-CONTROL SYSTEM; J. Eaton, Schenectady, N. Y. App. filed Oct. 7, 1912. Motor brought to rest by dynamic braking and then started in opposite direction.

1,079,483. ELECTRICAL SIGN RECEPTACLE; E. H. Freeman, Trenton, N. J. App. filed May 17, 1913. Telescopic socket parts engaged in hole in the supporting element or "sign sheet."

1,079,502. DYNAMO-ELECTRIC MACHINE; W. Linke, Westend, and L. Dreyfus, Neider-Schönhausen, Germany. App. filed June 23, 1911. To render the phases symmetrical both in phase position and in magnitude.

1,079,526. TYPEWRITING MACHINE; C. H. Vogel, Vancouver, B. C., Canada. App. filed Aug. 22, 1910. Electromagnetically operated type bars.

1,079,532. ADJUSTABLE TIMING APPARATUS FOR ELECTRIC IGNITION SYSTEMS; A. Zahringer, Stuttgart, Germany. App. filed Aug. 1, 1912. Adjustable connection between the timing lever and the cam ring.

1,079,533. TELEPHONE SWITCHING SYSTEM; W. Aitken, Liverpool, England. App. filed June 9, 1913. Switch is held in operated position and is automatically restored to normal when the disconnect signal is given.

1,079,538. AUTOMATIC DISINFECTANT HOLDER FOR TELEPHONE MOUTHPIECES; A. B. Buckland, Rochester, N. Y. App. filed Feb. 24, 1913. Hollow antiseptic-containing ring removably clamped to mouthpiece.

1,079,554. BRUSH HOLDER FOR DYNAMO-ELECTRIC MACHINES; J. H. Holmes, Newcastle-Upon-Tyne, Eng. App. filed June 28, 1913. Feeds the brush in a rectilinear path and with substantially constant pressure.

1,079,588. ELECTRIC RETORT FURNACE; J. Bally, Grenoble, France. App. filed July 5, 1912. Parallel retorts grouped around a central space with an inductor rotating in said space.

1,079,601. WRAPPING AND UNWRAPPING MACHINE; C. Kuentzel, Akron, Ohio. App. filed Oct. 31, 1912. Particularly for wrapping and unwrapping tires for shipping purposes or for covering and uncovering wires and cables.

1,079,621. THERMO-ELECTRIC COUPLE; E. Weintraub, Lynn, Mass. App. filed Oct. 27, 1909. One element of the couple is fused boron.

1,079,629. RESISTANCE RING FOR ROTORS; J. M. Barr, Indianapolis, Ind. App. filed Dec. 6, 1912. An opening is provided to reveal the integral union of the conducting bar with the resistance ring of a squirrel-cage rotor.

1,079,649. ELECTRIC BELL; A. Jackson, Fruitvale, Cal. App. filed June 2, 1913. Magnets supported on standard with pivoted armature above and contact stop above that.

1,079,651. PLATFORM INDICATOR; C. J. Kintner, New York, N. Y. App. filed Feb. 14, 1913. Cars automatically close circuit for a "Watch your step" phonograph or lights beneath the edge of the station platform.

1,079,660. INCANDESCENT-ELECTRIC-LAMP SOCKET; E. A. Olley, Syracuse, N. Y. App. filed July 25, 1912. Base engages the rear side of a support, and the socket seated in the opening engages the front side of the support.

1,079,667. ELECTRIC FIRE-ALARM SYSTEM; J. G. Schlüchtner, Brooklyn, N. Y. App. filed Jan. 4, 1913. For indicating the location of the fire to a "central" point, such as underwriters' headquarters.

1,079,708. VAPOR-ELECTRIC LAMP; O. O. Kruh, Schenectady, N. Y. App. filed June 22, 1903. Impresses a high voltage upon a main electrode and one of the starting electrodes.

1,079,727. PROCESS FOR BLEACHING AND THICKENING OILS AND FATS; O. Scherieble, Esslingen, Germany. App. filed Feb. 14, 1913. Passes high-potential current through the oil in the presence of oxygen.

1,079,740. PULL-SOCKET SWITCH; F. Barr, New York, N. Y. App. filed July 20, 1911. Chain guide held in place without attachment to the switch block.

1,079,760. ANSWERING AND RECORDING TELEPHONE; C. J. Gustafson, Aberdeen, S. D. App. filed March 22, 1913. Phonograph records and reproduces the telephoned speech.

1,079,777. MANUFACTURE OF INCANDESCENT BODIES OF METALLIC TUNGSTEN OR MOLYBDENUM FOR ELECTRIC INCANDESCENT LAMPS; A. Lederer, Atzgersdorf, Vienna, Austria-Hungary. App. filed Aug. 25, 1906. Mixes powdered tungsten with amorphous sulphur, shapes by pressure and heats.

1,079,804. FILAMENT LAMP; M. Sidon, New York, N. Y. App. filed April 27, 1911. Bulb made in separable sections and filament frame removably engaged on a combined supporting and terminal rod.

1,079,851. CHANGEABLE SIGN; B. Fried, Budapest, Austria-Hungary. App. filed June 28, 1911. Monogram sign having flaps operated by selectively controlled solenoids.

1,079,895. ELECTRIC HEATER; I. F. Talbot, Boise, Idaho. App. filed Dec. 20, 1912. Heating element electrically connected with a transformer inclosed within a heat-transmitting medium.

1,079,926. ELECTRIC-VAPOR APPARATUS; C. O. Bastian, London, Eng. App. filed Dec. 19, 1905. Heat-dissipating capacity of the cathode chamber bears the same relation to the corresponding heat-dissipating capacity of the anode that the heat generated by one of said electrodes bears to that generated at the other.